NASA Contractor Report 3171



# Performance, Physiological, and Oculometer Evaluation of VTOL Landing Displays

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# Performance, Physiological, and Oculometer Evaluation of VTOL Landing Displays

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# SECTION 1

## SUMMARY

A methodological approach to measuring workload was investigated for evaluation of new concepts in VTOL aircraft displays. Physiological, visual response, and conventional flight performance measures were recorded for landing approaches performed in the NASA Langley Visual Motion Simulator (VMS). Three displays (two computer graphic and a conventional flight director), three crosswind amplitudes, and two motion base conditions (fixed vs. moving base) were tested in a factorial design.

Multivariate discriminant functions were formed from flight performance and/or visual response variables to maximize detection of experimental differences. The flight performance variable discriminant showed maximum differentiation between crosswind conditions. The visual response measure discriminant maximized differences between fixed vs. motion base conditions and experimental displays.

Physiological variables were used to attempt to predict the discriminant function values for each subject/condition trial. The weights of the physiological variables in these equations showed agreement with previous studies. High

muscle tension, light but irregular breathing patterns, and higher heart rate with low amplitude all produced higher scores on this scale and thus, represented higher workload levels.

# SECTION 2

# INTRODUCTION

Commercial helicopter operations in the next decade will require the ability to perform curved, steep, decelerating instrument landings in small volumes of airspace at crowded terminal areas. Although there will be increased automation of controls and more capable on-board avionics, manual piloting will still be an important requirement. The display systems for these aircraft should present the critical information while requiring the least workload, since the reserve capacity of the pilot will continue to be extremely important for reacting to and handling emergency and fail-op situations.

Critical evaluation of display format alternatives, therefore, should incorporate workload metrics which not only express pilot performance but also express the difficulty with which this performance was achieved. That is, we need to know both how well the pilot performed and how hard it was for him to achieve his measured performance. Previous studies investigating the merit of different display formats have attempted to estimate workload by the use of concurrently performed secondary tasks such as tapping tasks,[1] choice reaction tasks, and number cancelling tasks.[2] This method has not been successful because: 1) primary performances often are not equivalent across conditions, 2) certain secondary and primary tasks interact differently, and 3) the total capacity of the subject is not always used by the secondary task.

Recently, successful measurements of workload have been developed for evaluation of controls and displays in simulation and flight test programs for both

fixed and rotary wing aircraft.[3, 4, 5, 6, 7] This method uses both performance and physiological data to form a metric of information processing workload. The major goal of this study was to explore the potential of this metric for the evaluation of workloads imposed by three candidate VTOL information displays. A second goal was to evaluate the effects of simulator motion and crosswind amplitude on pilot workload.

## Conceptual Approach

The landing phase of piloting a VTOL aircraft severely taxes the pilot's information processing and response capabilities. During landing approach, deceleration, and hover, the pilot shares attention between tasks. The overall performance of the system is determined by the difficulty of the tasks involved. Generally, the factors influencing difficulty can be categorized as: 1) information display formats, 2) external forces (that is, wind, visibility), 3) kinesthetic (motion) cues, and 4) pilot experience and skill level. Other items that affect overall performance are the plant dynamics and control force characteristics. In addition, individual pilot variance from mission to mission will affect performance due to fluctuations in fatigue, attention level, and motivational and situational variables.

This study explored the relationship between increasing task demand or difficulty and resultant workload measured in several ways. Conventional flight performance error parameters such as heading, pitch, roll, and power setting are used to evaluate system performance. A relationship between such measures and task difficulty is hypothesized in Figure 1. At very low levels of difficulty, performance error remains at a constant and low level. Increasing difficulty does not impair performance in this region, although workload is increased due to

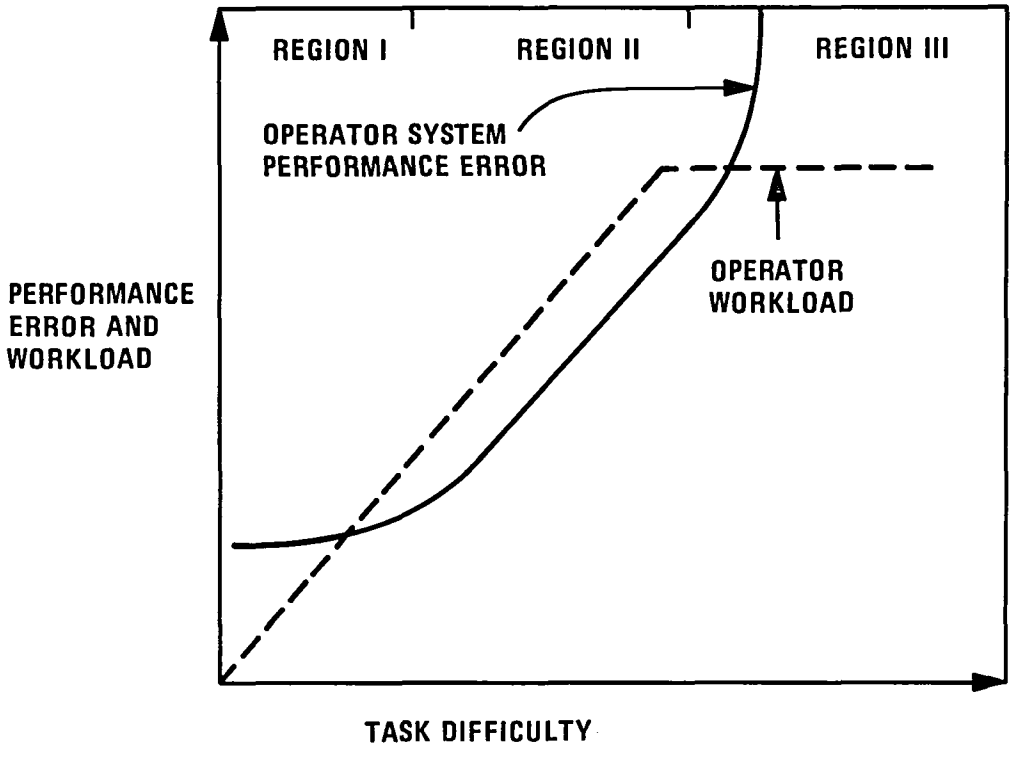


Figure 1. Hypothetical Relationship Between Operator Performance Error and Workload Level Across Increasing Task Difficulty

increasing task difficulty. This is due to the ability of the pilot to compensate for these demands with no resultant performance degradation.

In the next region of task difficulty, performance error and workload are positively correlated. Increased difficulty causes increased performance error. This is analogous to landing approach performance under reduced visibility or high crosswind gust conditions.

In the third region, performance and workload level diverge. Conditions are such that increased difficulty caused by deteriorating operational conditions are beyond the pilot's capability to compensate. Increased performance error continues, but the effective workload on the operator has reached a ceiling. This region is analogous to near complete loss of external visibility during approach or loss of control of a critical flight parameter.

Thus, the relationship between performance error and actual workload is hypothesized as non-linear across increases in task difficulty factors. Conventional flight testing of new display/control concepts are conducted under conditions that often fall in the first region or lower part of the second region described above. The operational environment thus does not always evaluate these systems under high workload or near-worst-case conditions. Furthermore, the conventional measures of flight performance may: 1) not be available or 2) be inappropriate for the particular task being evaluated. Terrain following helicopter flight performance, for instance, is not easily measured by conventional flight path error scores.

## Experimental Variables

Display Considerations--An analysis of current trends in display design for VTOL cockpits shows emphasis on graphically presented, cathode ray tube (CRT), multifunction displays that combine several important information sources. Such concepts are evident in the Navy's Advanced Integrated Display System (AIDS) and the Air Force's Digital Avionics Information System (DAIS). Similar integrated formats have been evaluated recently for VTOL aircraft.[8]

With the above guidelines in mind, three displays were chosen for evaluation: 1) a CRT graphic display employing a "fly from" guidance principal (GRAPHIC I), 2) a CRT display employing combinations of "fly from" and "fly to" principles (GRAPHIC II), and 3) a conventional flight director. The GRAPHIC I display was expected to require the least amount of workload, while the GRAPHIC II display was expected to require the greatest workload. The flight director was estimated to be an intermediate workload condition. These estimates were based on pilot opinion. A preliminary experiment was conducted to verify these estimations.

Crosswind Effects--Helicopter approach to landing performance has been shown to be a function of the amplitude and deviation of crosswind.[9] Increases in mean wind and gust amplitude were evaluated in this study by incorporating three wind conditions of progressively increasing velocities and crosswind gust amplitudes. One condition was no wind, while the others were of medium and high amplitude.

Effects of Simulator Motion--Several studies have shown that simulator motion is a contributing factor to performance differences in evaluations of different flight displays. Matheny, Dougherty, and Willis[10] compared two attitude indicator displays (moving airplane and moving horizon) and found that without motion, the moving airplane indicator was superior to the moving horizon; but when motion cues were added, no performance differences were evident. Furthermore, performances were generally improved on both display formats when motion was added.

Further evidence of this effect was found by Ince, Williges, and Roscoe[1] who compared three types of motion: 1) no motion, 2) standard simulator motion, and 3) washout motion (effect of roll acceleration cues is subliminally and gradually eliminated subsequent to a roll input by the pilot). The third condition produced results most representative of a complementary in-flight study.[11] Thus, these three studies indicate the importance of the incorporation of motion cues to enhance the generality of results from display evaluation studies conducted in simulators.

The effect of simulator motion (six degrees of freedom motion vs. no motion) was also investigated in this study. All display conditions were evaluated in the presence and absence of simulator motion.

Objectives--The major objective of this study, therefore, is to explore the relationship between potential workload measures such as physiological and visual response variables and conventional flight performance error measures. Further establishment of a relationship between these measures, as shown in previous studies,[4, 5, 6, 7, 12, 13] would provide support for developing a workload metric useful under virtually any operational/task conditions.

A second important objective is the comparison of conventional and currently considered computer generated displays for VTOL aircraft. Three displays were chosen for this comparison, and results were evaluated in terms of performance error and workload reduction during helicopter landing approaches.

Two additional variables were included to evaluate the effect of simulator motion cues on performance and the effect on performance of crosswind gust amplitude during landing. The primary rationale for the inclusion of increasing wind amplitude was to increase task difficulty as indicated in the conceptual approach. In addition, the specific performance attained under the three wind conditions used was also of interest.

Use of trade names or names of manufacturers in this report does not constitute an official endorsement of such products or manufacturers, either expressed or implied, by the National Aeronautics and Space Administration.

# SECTION 3

# METHOD

## Overview

Six pilots flew a total of 90 approaches each to hover in the VMS. Each trial consisted of a complete approach divided into three segments of data collection: 1) descent, 2) deceleration, and 3) hover. Experimental conditions for a trial were created by combining display, crosswind, and motion conditions. Physiological, visual response, and conventional flight performance measures were recorded for each trial, and pilot opinion scores were obtained for each major experimental condition.

## Simulation System

The VMS facility with Huey-Cobra helicopter dynamics was used in this experiment.[14] A block diagram of the simulation/display is shown in Figure 2. A pictorial representation of the experimenter's control station is presented in Figure 3. The CDC-Cyber 175 computer served as the host computer for simulation software. Signals for the flight display were sent from the Cyber 175 to the ADAGE graphic display system or the flight director. The ADAGE display produced images for two of the three experimental displays (GRAPHICS I and II). The CRT image was transferred to a video display via a graphic-to-video converter and video camera. The signal was then sent to the instrument panel CRT display. The third instrument display was a conventional flight director (F-DIR). Signals from the Cyber 175 drove the ADI (Sperry HZ-6B). The ADI display image was transmitted to the instrument panel CRT via a video camera.

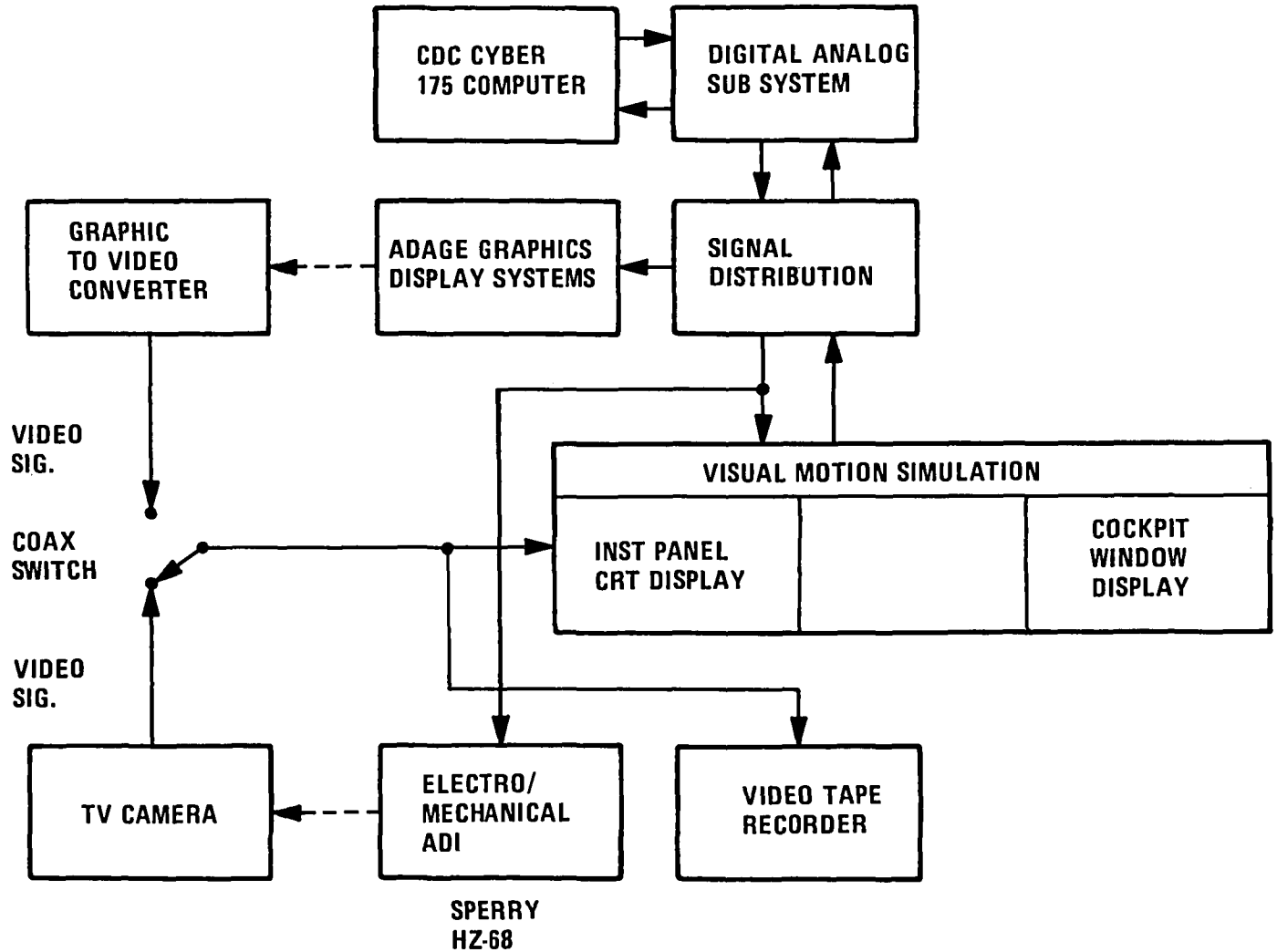


Figure 2. Equipment/Simulator Interfaces for Experiment

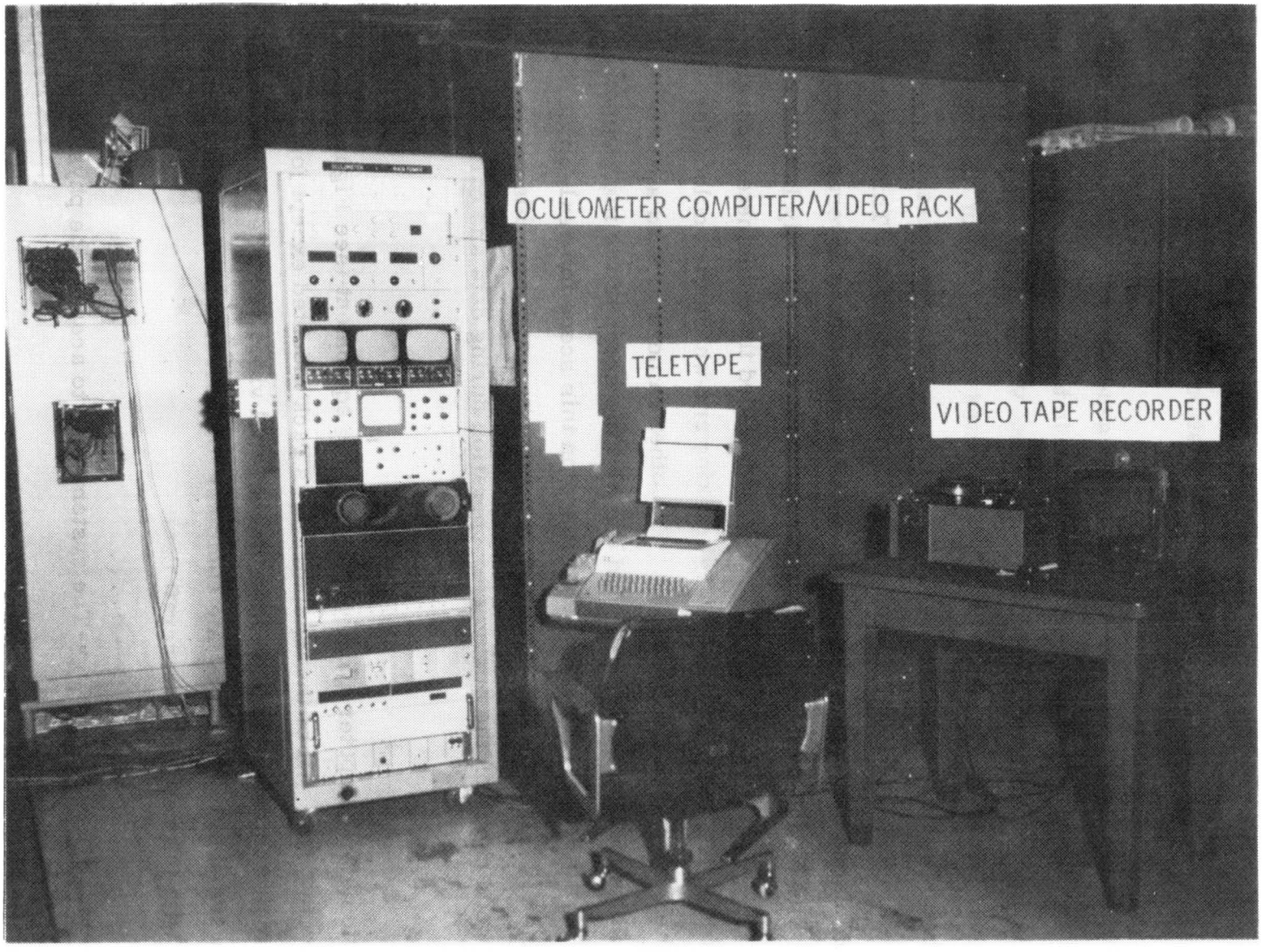


Figure 3. Oculometer Control Station

## VMS/Oculometer Installation

The oculometer equipment was located in two general areas. The oculometer optical head and television cameras were mounted in the cockpit, and the analysis and evaluation components were mounted outside the VMS. In the cockpit (see Figure 4), the oculometer's optical head was mounted to the front of the instrument panel below and to the left of the CRT display with the oculometer's moving mirror drive amplifiers located just above the instrument panel. This optical head position placed all five instruments inside the oculometer coverage area. One camera was mounted on the top of the instrument panel directly in front of the pilot looking at the pilot's head. This camera aided the oculometer operator by showing which eye the oculometer was tracking and where the oculometer was searching when the eye was not in track. The other camera located above and behind the pilot's right shoulder provided a real-time scene of the instrument panel. The pilot's lookpoint was superimposed on this scene for real-time viewing by the test director and recorded for later observation. This scene also served as a good check on the oculometer operation during data and calibration runs.

The oculometer computer and associated video equipment (see Figure 3) were located near the VMS. All of the equipment was rack mounted except for the teletype computer interface and the instrument panel video recorder. The oculometer data were sent to the real-time computer for conversion to digital format and storage with the rest of the aircraft data.

Physiological Data Recording--The system used to acquire the physiological data is described below:

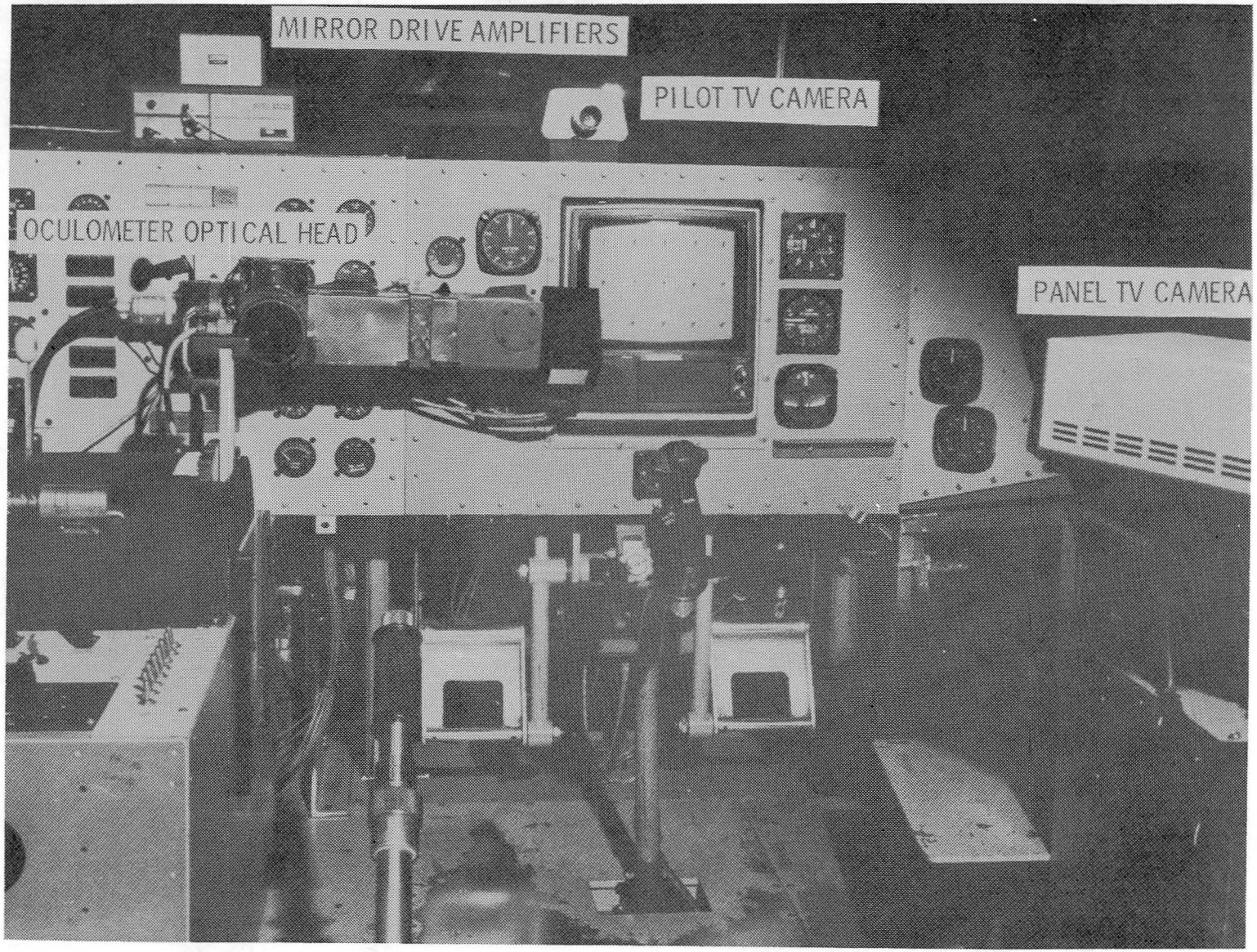


Figure 4. Oculometer Installation in Simulator

Electrocardiogram (ECG): Recorded from electrodes approximately 7.6 cm below the front edge of the armpit with a reference electrode at waist level on the subject's right side. The electrode outputs were conditioned by a Honeywell Accudata 135A biomedical amplifier and ECG isolator. Low and high pass filters were set at 0.05 Hz and 100 Hz. Overall voltage gain was approximately 1000:1.

Electromyogram (EMG): Recorded from electrodes on left and right forearms (two data channels). The electrode outputs were processed by a Honeywell Accudata 135A amplifier with EEG/EMG preamplifier. Low and high pass frequency filters were set at 50 Hz and 2500 Hz. Overall voltage gain was approximately 500:1.

Respiration: Recorded from mercury chestband respiration transducer and amplified with a Honeywell Accudata 137 respiration control/tachometer. The waveform output was used.

The above physiological variables were selected based on previous work [4, 5, 6, 7, 8] as having the best potential for producing extracted features that are correlates of task performance and pilot-opinion scores.

## Experimental Design

There were five factors in the experimental design: 1) displays (3 levels), 2) winds (3 levels), 3) motion (2 levels), 4) replications (5 levels), and 5) subjects (6 levels). Thus, it was a 3 x 3 x 2 x 5 x 6 factorial design. Total data points of 540 result from this design. Replications refers to the number of flights each subject flew with identical combinations of displays, winds, and motion. Figure 5 shows the 18 experimental conditions.

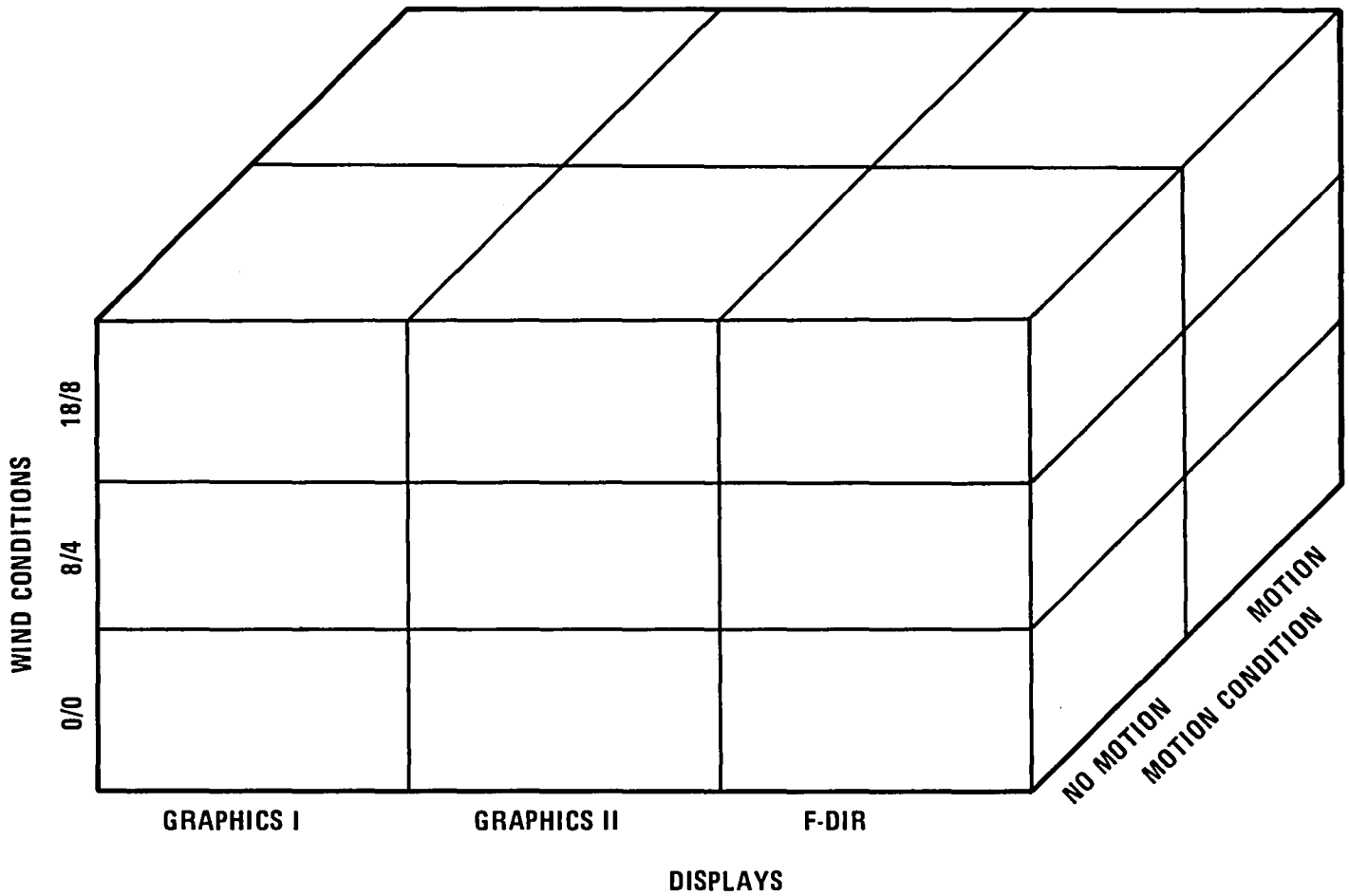


Figure 5. Experimental Design

Simulator Motion--The two motion conditions consisted of: 1) washout motion [14] provided in the Langley moving base VMS, and 2) a no-motion condition using the simulator as a fixed-base device.

Displays--

GRAPHIC I and GRAPHIC II: The two computer produced graphic flight displays are shown in Figures 6a and 6b. The basic difference between these displays is that: 1) pitch command is separated from roll command in the GRAPHIC II display and represented as the vertical position of the two wedges, and 2) roll and pitch indications are combined on the GRAPHIC I display, while power has a separate indication. We hypothesized that the GRAPHIC II display would create a more difficult visual information integration problem for the aviator than the GRAPHIC I display.

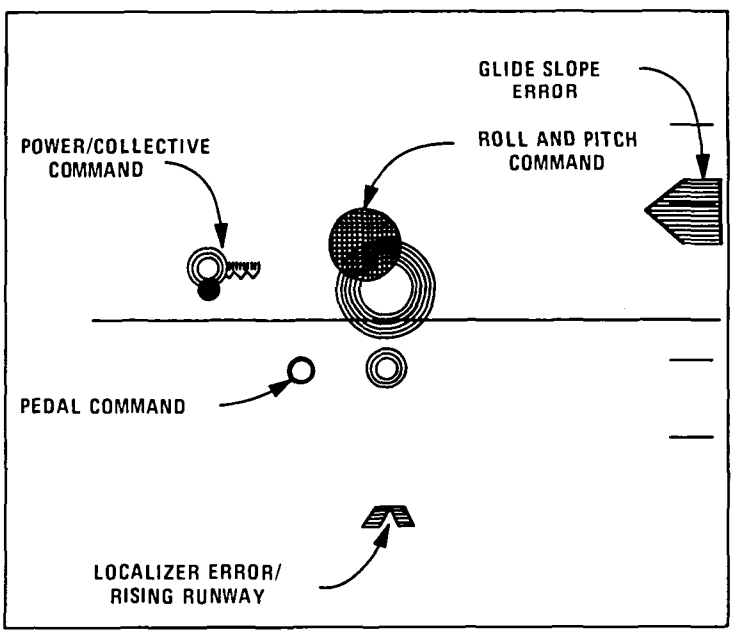


Figure 6a. GRAPHIC I Display

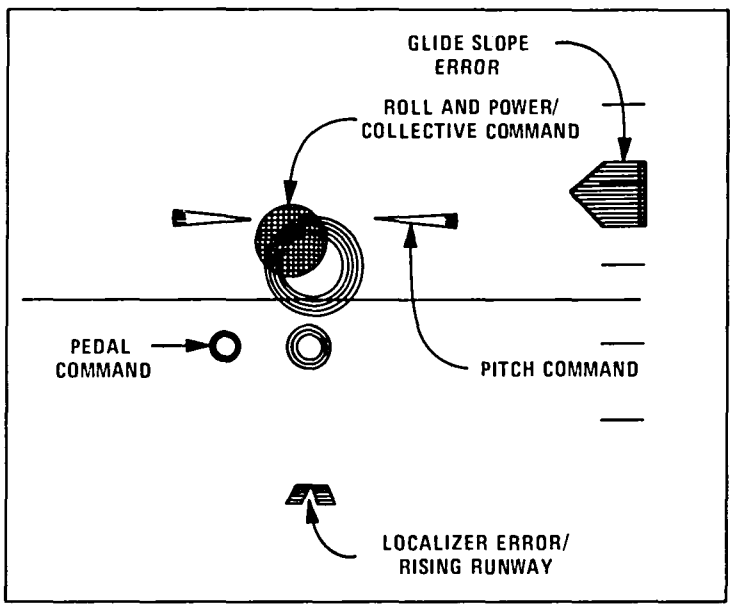


Figure 6b. GRAPHIC II Display

ADI flight director: The conventional electromechanical ADI flight director used in this study is presented in Figure 6c.

Winds--Three conditions of increasing wind and gust amplitude were used to cause conditions of increasing difficulty. Crosswind steady-state velocities (in knots) and RMS gust velocities were: 1) no wind, 2) 8 knots with 1.3 m/sec (4 ft/sec) gusts, and 3) 16 knots with 2.6 m/sec (8 ft/sec) gusts. These three conditions will be referred to by the following coding scheme:

- Condition 1 as 0/0
- Condition 2 as 8/4
- Condition 3 as 16/8

The gust model used to generate these conditions during the trials was based on a model discussed by Pritchard.[15] Wind direction was an absolute side force from the left.

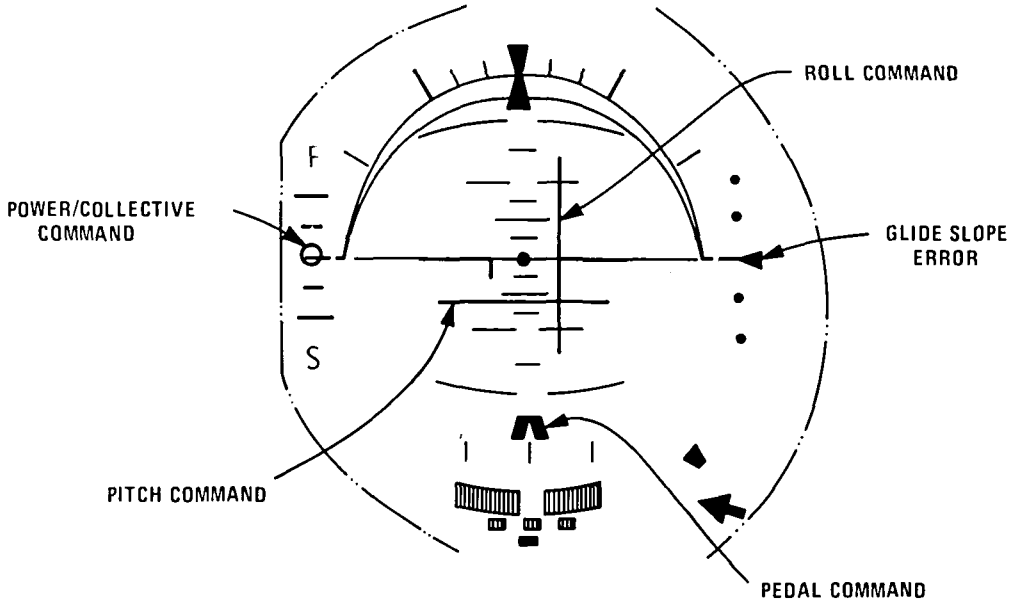


Figure 6c. Flight Director Display

## Subjects

Two test subjects were Army civilian research pilots; two were military test pilots. All of them were current. The two remaining test subjects were flight test engineers with prior military helicopter pilot experience.

## Experimental Procedure

Flight Task Segments--The pilot's task was to complete an approach to landing sequence on each trial under the specific combinations of wind, motion, and display conditions outlined above. Each trial, or approach, consisted of three segments (see Figure 7): 1) descent, 2) deceleration, and 3) hover. Prior to the descent segment, a turning maneuver was required to intercept the final approach heading. Data collection was begun as soon as the glide path was

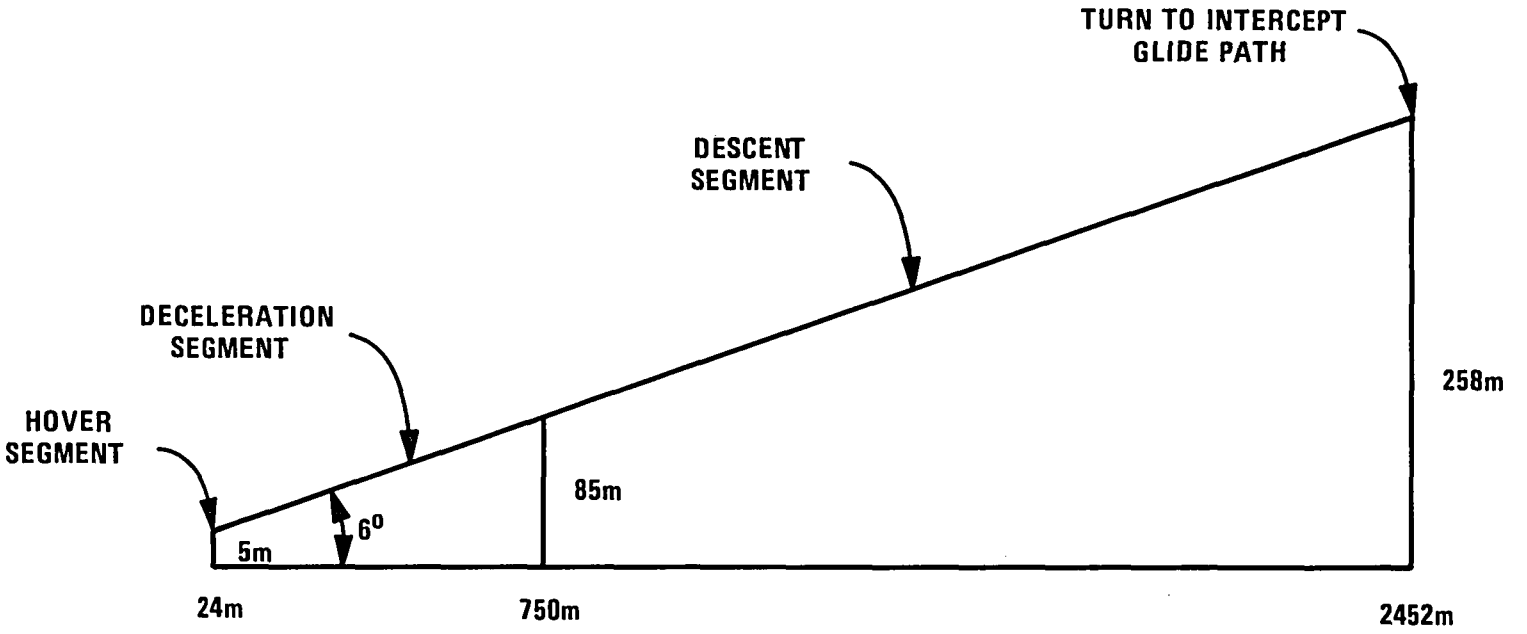


Figure 7. Landing Approach Range and Altitudes

intercepted. The deceleration segment was defined as the 815m to 24m range from touchdown point. The deceleration profile used in this study had a maximum deceleration value of 0.12g with a ground speed value of 65.2 knots at a range of 903m. The hover segment was begun when the pilot reached the 24m range at 6m altitude. This segment was terminated after the hover conditions were maintained for 45 seconds. Data was analyzed separately for each of the three segments because they represented different requirements on the pilot and the displays.

Experimental Sessions--Each experimental session consisted of nine approach conditions. The first three approaches were performed with the 0/0 wind condition, approaches four through six with the 8/4 wind condition, and approaches seven through nine with the 16/8 wind condition. The display conditions were counterbalanced within wind conditions. Two subjects shared the simulator on an alternating basis. Each session lasted approximately 45 minutes. Motion vs. no-motion conditions were alternated for each subject.

## Data Analysis Procedures

The statistical analysis procedures followed techniques applied in References 5, 6, and 7. These procedures are shown in Figure 8. Analog data tapes are sampled and selected features extracted. Physiological features are simple statistical summaries (that is, mean and standard deviations) of selected waveform characteristics computed over some interval.

Feature data obtained from analog tape-recorded signals and other response data are then normalized by

$$Z_{ij} = \frac{X_{ij} - \bar{X}_j}{\sigma_{x_j}}$$

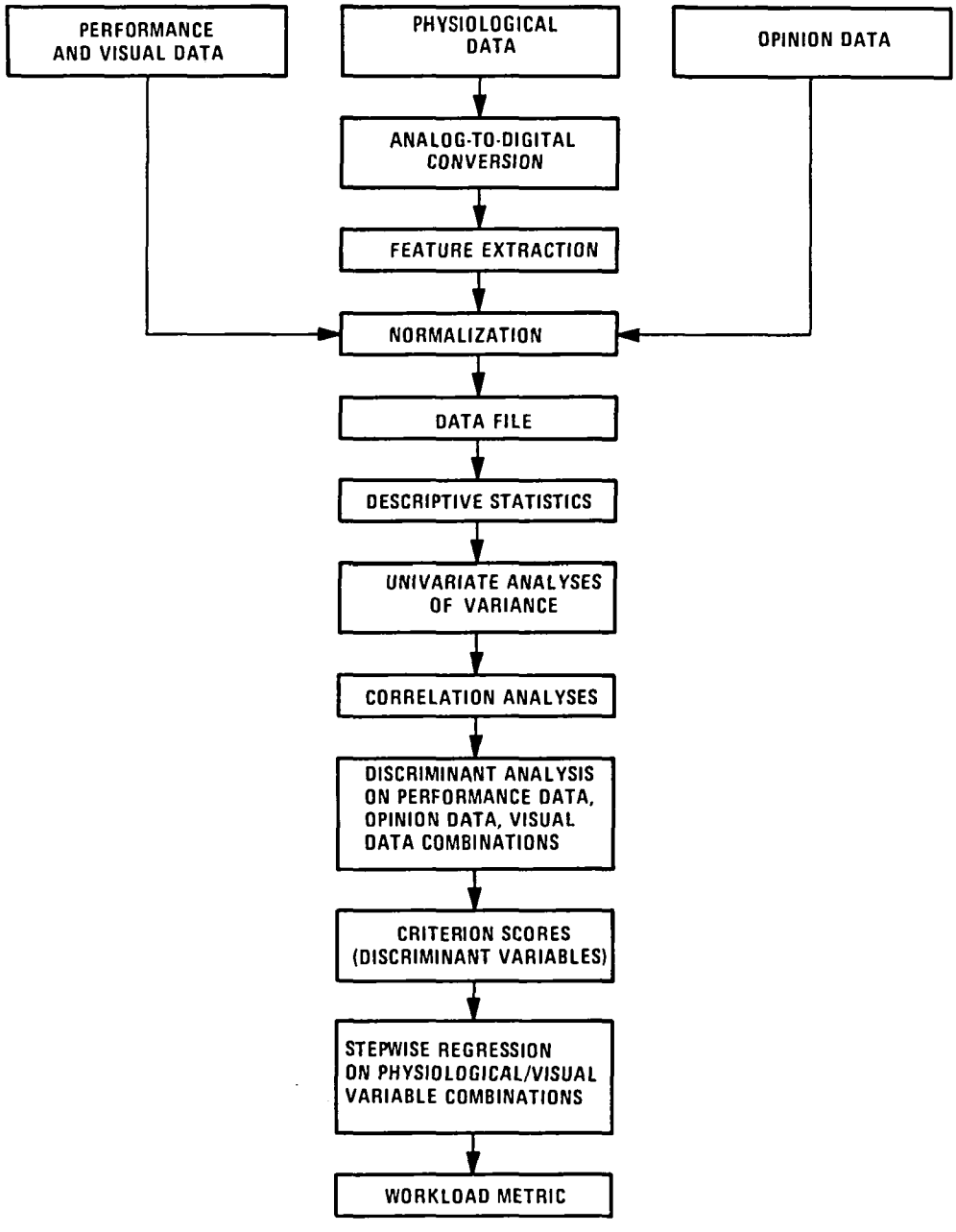


Figure 8. Data Analysis Strategy

where

$X_{ij}$ = raw score value i on response measure j

$Z_{ij}$ = normalized value of $X_{ij}$

$\overline{X}_j$ = mean raw score value on measure j

$\sigma_{x_j}$ = standard deviation of raw scores for measure j

Normalization in the above manner generates a transformed set of data which places all response measures on a common scale with zero mean and unity standard deviation for each measure. The resulting file containing all normalized data provides the data base for all subsequent analyses. Simple statistics (mean and standard deviations), univariate analyses of variance, and correlation coefficients are computed on all variables in the data base to summarize effects of test conditions and interrelationships between variables.

Multiple discriminant and multiple regression techniques are the primary statistical tools applied in the analysis procedure. These techniques are summarized below and described in greater detail in References 4, 5, and 16.

The approach to derivation of the actual workload metric is a prediction problem. Various combinations of data sets are used to generate criterion scores which are derived from discriminant analysis. The predictor scores are derived from the physiological and/or visual data. Several combinations of these data sets were then used in the present study. These combinations are outlined as follows.

| Problem Set | Regression Analysis Groups | Discriminant Analysis Groups |
|---|---|---|
| A | Physiological data | Performance/opinion data |
| B | Physiological data | Performance/opinion and visual performance data |
| C | Physiological data | Visual data |
| D | Physiological and visual response data | Performance/opinion data |
| E | Visual response data | Performance/opinion data |

It should be noted that visual (oculometer) data was used both as a predictor and as a criterion variable in separate analyses. This was because of the nature of the variables involved. Visual data could be considered in a physiological sense and thus grouped with the physiological features or the performance variables in developing discriminant functions.

Discriminant Analysis--The first step in this process is to derive linear combinations of performance and opinions scores that best differentiate between the 18 conditions. This is accomplished by multiple discriminant analysis. A discriminant function resulting from this analysis defines a single scale composed of the original set of performance and opinion data and can be expressed by the general form

$$D_i = \sum_{j=1}^{n} (a_j Z_{ij}) \qquad (1)$$

where

$D_i$ = score i on discriminant scale D

$Z_{ij}$ = normalized score $Z_i$ on performance and/or visual data variable

$a_j$ = weighting coefficient on variable j

n = number of variables included in the discriminant analysis

In effect, values of D for Equation (1) create a "new" variable which is a composite based on the performance and opinion variables entered into the analysis. Advantages of this technique are that the information content in each variable is used toward maximization of group (condition) differences, and the relative contribution of each variable can be assessed. Composite variables generated in this manner were statistically analyzed in the same way as the individual variables constituting the discriminant function (see Figure 8).

Stepwise Regression Analysis--A discriminant function produced by the process described above can be interpreted as a scale of difficulty imposed by the various experimental conditions. A discriminant score derived from performance and opinion data on a particular trial represents a position on this scale relative to scores from all other trials. Using the discriminant score as a criterion measure, stepwise multiple regression may be used to derive the predictive relationship between the physiological/visual response measures and this criterion score.

Stepwise regression is a procedure for selective examination of the available predictor variables for their individual contributions to the explanation of variance in the criterion measure. The variables that are included in the final equation are the set with the highest unique contribution to prediction of criterion variability. At each step, a partial F test for each variable is computed and

compared to a preselected value. A variable not yet in the equation which provides the greatest contribution to accounting for the variance is added to the equation. As variables are added, a variable placed in the equation on previous steps may no longer provide significant unique contribution to prediction of criterion variability. If so, that variable is removed. This stepwise process is continued until none of the predictor variables can be incorporated into, or removed from, the regression equation based on the partial F test.

The result is a linear combination of a minimum set of predictor variables and associated weighting coefficients which best predict response on the criterion variable. Expressed as a prediction equation, this result is

$$\hat{D}_i = \sum_{j=1}^{m} (b_j Z_{ij}) \qquad (2)$$

where

$\hat{D}_i$ = predicted score i on discriminant scale D

$Z_{ij}$ = normalized score $Z_i$ on physiological or visual response variable j

$b_j$ = weighting coefficient on variable j

$m$ = number of variables providing significant unique contribution to prediction of scores on discriminant scale D

Within the conceptual framework of this study, Equation (2) above operationally defines the form of a workload metric. Thus,

$$W_i = \sum_{j=1}^{m} (b_j Z_{ij}) \qquad (3)$$

where

W = workload metric

Stepwise regression analyses were performed on several combinations of predictor variables to identify a combination which best characterized workload with as few variables from as few sources as possible. Variable combinations analyzed are discussed in Section 4.

Univariate Analysis of Variance Tests--A five factor analysis of variance was performed on each variable to determine the effects of displays, motion base, and wind. A fourth factor, replications, was analyzed but will not be reported in this study. Each of the above effects was tested by the appropriate subject-effect interaction component.

## Variables Analyzed

Physiological Features--Twenty-one physiological features were extracted on each trial. These features are listed in Table 1 with their descriptions and a mnemonic indicator which will be used to abbreviate references to each variable in subsequent sections.

Physiological features represented in variables 1 through 20 are defined in Figure 9. ECG waveform amplitudes are defined relative to a common baseline which is the mean signal level recorded on each trial (see Figure 9 for examples of R- and S-wave amplitudes). Samples of EMG and respiration amplitude are defined by absolute value of the difference between consecutive peaks (slope reversals). The ECG R-wave interval is the duration between R-wave peaks in this periodic waveform. Respiration duration is defined in a similar manner as the interval between successive signal peaks in the same direction.

Table 1. Physiological Performance Features

| Variable | Description | MNEMONIC |
|---|---|---|
| 1 | EMG, amplitude, right, mean | EMGARM |
| 2 | EMG, amplitude, right, standard deviation | EMGARS |
| 3 | EMG, amplitude, left, mean | EMGALM |
| 4 | EMG, amplitude, left, standard deviation | EMGALS |
| 5 | Respiration amplitude, mean | RESAMP |
| 6 | Respiration amplitude, standard deviation | RESAMS |
| 7 | Respiration duration, mean | RESPDM |
| 8 | Respiration duration, standard deviation | RESPDS |
| 9 | ECG, amplitude R-wave, mean | ECGRAM |
| 10 | ECG, amplitude R-wave, standard deviation | ECGRAS |
| 11 | ECG, R-wave duration, mean | ECGRDM |
| 12 | ECG, R-wave duration, standard deviation | ECGRDS |
| 13 | ECG, P/R ratio | ECGP/R |
| 14 | ECG, Q/R ratio | ECGQ/R |
| 15 | ECG, S/R ratio | ECGS/R |
| 16 | ECG, T/R ratio | ECGT/R |
| 17 | ECG, P interval | ECGPIN |
| 18 | ECG, Q interval | ECGQIN |
| 19 | ECG, R interval | ECGRIN |
| 20 | ECG, S interval | ECGSIN |
| 21 | ECG, T interval | ECGTIN |

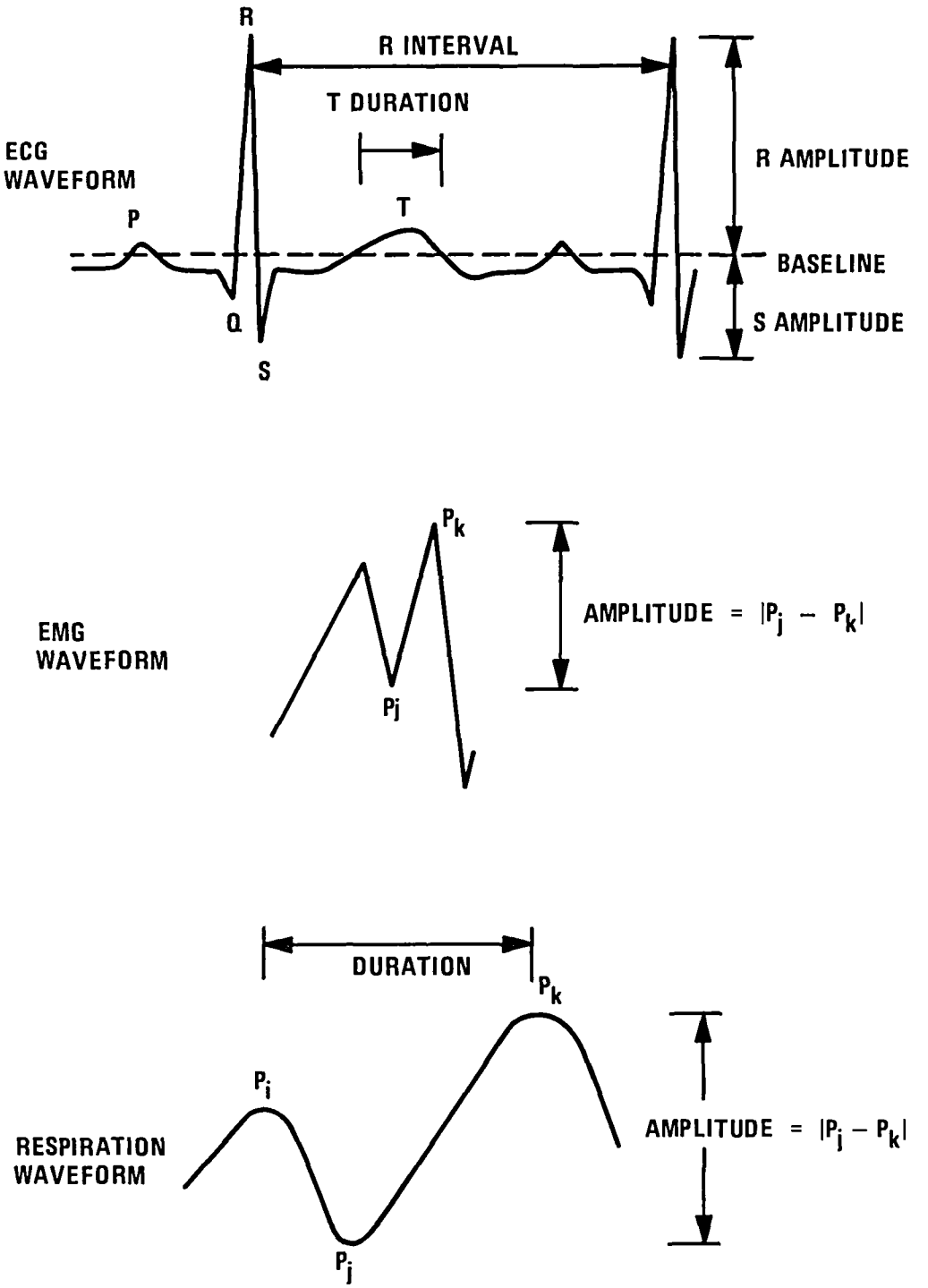


Figure 9. ECG, EMG, and Respiration Waveform Features

Flight Performance Variables Recorded--Fourteen flight performance variables were recorded for each approach segment. A list of these variables is presented in Table 2.

Visual Response Measures--Seven visual response measures were recorded during simulation trials. These measures are identified in Table 3.

A dwell time consisted of the number of continuous lookpoints that were within a 1.27 cm radius of the centroid of the previous lookpoints of the current dwell. A minimum of four points were needed to define a dwell. Three were

Table 2. Flight Performance Variables

| Variable | Description | Mnemonic |
|---|---|---|
| 1 | Percent display pitch error | PITCH |
| 2 | Percent display roll error | ROLL |
| 3 | Percent display power error | POWER |
| 4 | Percent display heading error | HEADING |
| 5 | Roll acceleration | ROLLAC |
| 6 | Pitch acceleration | PITCHAC |
| 7 | Yaw acceleration | YAWACC |
| 8 | Speed error | SPEEDER |
| 9 | Control position, pitch axis | S/PITCH |
| 10 | Control position, roll axis | S/ROLL |
| 11 | Control position, yaw axis | S/YAW |
| 12 | Power setting | POWSET |
| 13 | Altitude error, feet | ALTERR |
| 14 | Cross range error, feet | CXERR |

Table 3. Visual Response Measures

| Variable | Description | Mnemonic |
|---|---|---|
| 1 | Saccade length mean | SACCLM |
| 2 | Saccade length standard deviation | SACCLS |
| 3 | Dwell time mean, (sec) | DWELLM |
| 4 | Dwell time standard deviation, (sec) | DWELLS |
| 5 | Fixation rate (fixations/sec) | FIXRATE |
| 6 | Blink rate (blinks/sec) | BLINKR |
| 7 | Pupil diameter (mm) | PUPILD |

accepted if the first and last were less than 1.27 cm apart. A dwell was not stopped by a "no track logic signal" such as would occur during a blink. A blink consisted of a no track logic signal lasting from .125 to .375 second. Any no track logic signals lasting for longer than a blink were subtracted from the total run time for that segment so that the rate calculations would not be too misleading.

Opinion Questionnaire--An opinion questionnaire (see Figure 10) was administered to each pilot for each of the display/motion conditions to obtain a scalar rating of overall task workload. This form is based on the Cooper-Harper rating scale for handling qualities[17] which was modified for purposes of the present study to focus on task workload rather than aircraft handling qualities. It must be emphasized that the form as modified in Figure 10 has not been validated as a workload rating scale. Inferences of this modified form's validity should not be made based on extensive previous work and experience with the Cooper-Harper scale.

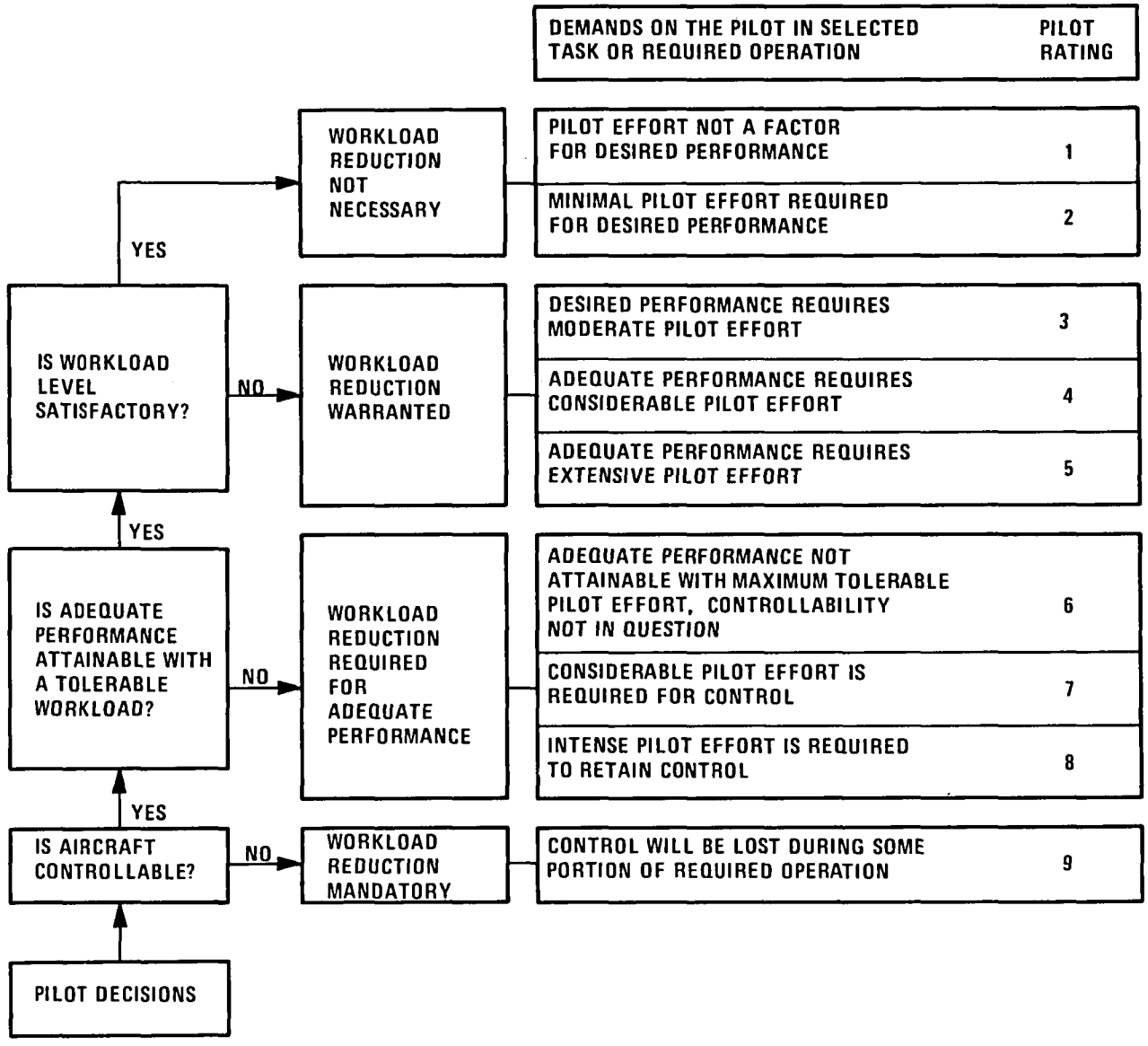


Figure 10. Workload Rating Scale

# SECTION 4

# RESULTS AND DISCUSSION

Reporting of results will be divided into univariate analyses of variance, correlation, multiple discriminant functions, and multiple regression.

## Univariate Analyses of Variance

Tables 4 through 6 summarize the main and interaction effects for the three data classes across flight segments. The mnemonics used in these tables correspond to the variable names shown in Tables 1 through 3 for physiological, flight performance, and visual response data classes, respectively. Cell means are found in Appendix A. Grand means across effects are presented in Appendix C.

### Physiological Data--

Displays: Right EMG amplitude and standard deviation were significantly higher for the GRAPHIC II display in the approach segment only. The flight director and GRAPHIC I displays produced nearly equal activity for these variables. Left EMG measures indicated high activity for GRAPHIC II, medium activity for GRAPHIC I, and least activity for the flight director. Although these effects were consistent across flight segments, this trend was not statistically significant in any segment.

Winds, motion, and their interaction: Figures 11 and 12 show the combined effects of winds and motion on four statistically significant physiological variables: EMGRAM, EMGARS, RESAMS, and ECGRIN.

Table 4. Summary of Univariate Analyses of Variance on Physiological Performance Measures[a]

| Variable | Experimental Effect: Displays (D) | Winds (W) | Motion (M) | (Interactions) DW | DM | WM | DWM |
|---|---|---|---|---|---|---|---|
| EMGARM | 1 | 23 | 123 | | | 123 | |
| EMGARS | 1 | 23 | 23 | | | 123 | |
| EMGALM | | 1 | | | | | |
| EMGALS | | 3 | | | | | |
| RESAMP | | | | | | | |
| RESAMS | | 123 | 1 | | | 1 | |
| RESPDM | | | 1 | | | | |
| RESPDS | | | | | | 1 | |
| ECGRAM | | | | | 3 | 3 | |
| ECGRAS | | | | | | | 3 |
| ECGRDM | | | | | | | |
| ECGRDS | | | | | | | |
| ECGP/R | | 1 | | | | | |
| ECGQ/R | | | | | | | |
| ECGS/R | | 3 | | | | | |
| ECGP/R | | | | | | | |
| ECGPIN | | 3 | 3 | | | | |
| ECGQIN | | | | | | | |
| ECGRIN | | | 123 | | 2 | 3 | |
| ECGSIN | 3 | | 2 | | | | |
| ECGTIN | 1 | | 3 | | | | |

[a]Flight segments represented by number (1 = approach, 2 = deceleration, 3 = hover); significance level is $p \leq .05$, unless segment is underscored, indicating $p \leq .01$.

For both EMGRAM and EMGARS, the main effect of motion shows increased muscle tension amplitude and deviation for motion base conditions over fixed base conditions. The effect of winds is primarily due to the increase found in the 16/8 wind condition with the moving base. The fixed base conditions showed no such changes across wind amplitude increase.

For RESAMS, a measure of respiration amplitude deviation across a trial, the main effect of winds was significant. Increasing gust amplitude produced an increase in deviation. No effect was evident for motion.

For ECGRIN, a measure of time between ECG peaks in the waveform, motion was significant. Shorter peak-to-peak times were observed in the moving base condition.

Note the general consistency of the above findings across all three flight segments, as evident in Figures 11 and 12. No significant effects were observed for respiration measures, although amplitude was generally higher with the F-DIR display.

Consistency with previous results: Muscle activity level (EMG) has been shown to be related to workload in tracking type tasks.[18] This result has also been reflected in similar experiments in the workload metric series.[3, 4, 5, 6, 7] This relationship was substantiated in the present study with right arm EMG amplitude and deviations increasing with increased difficulty (wind conditions). The moving base condition and GRAPHIC II display condition also produced high EMG activity suggesting a higher overall workload in these conditions. This interpretation should be viewed with extreme caution, however, as this result could easily be caused by the general instability of the body in the moving base

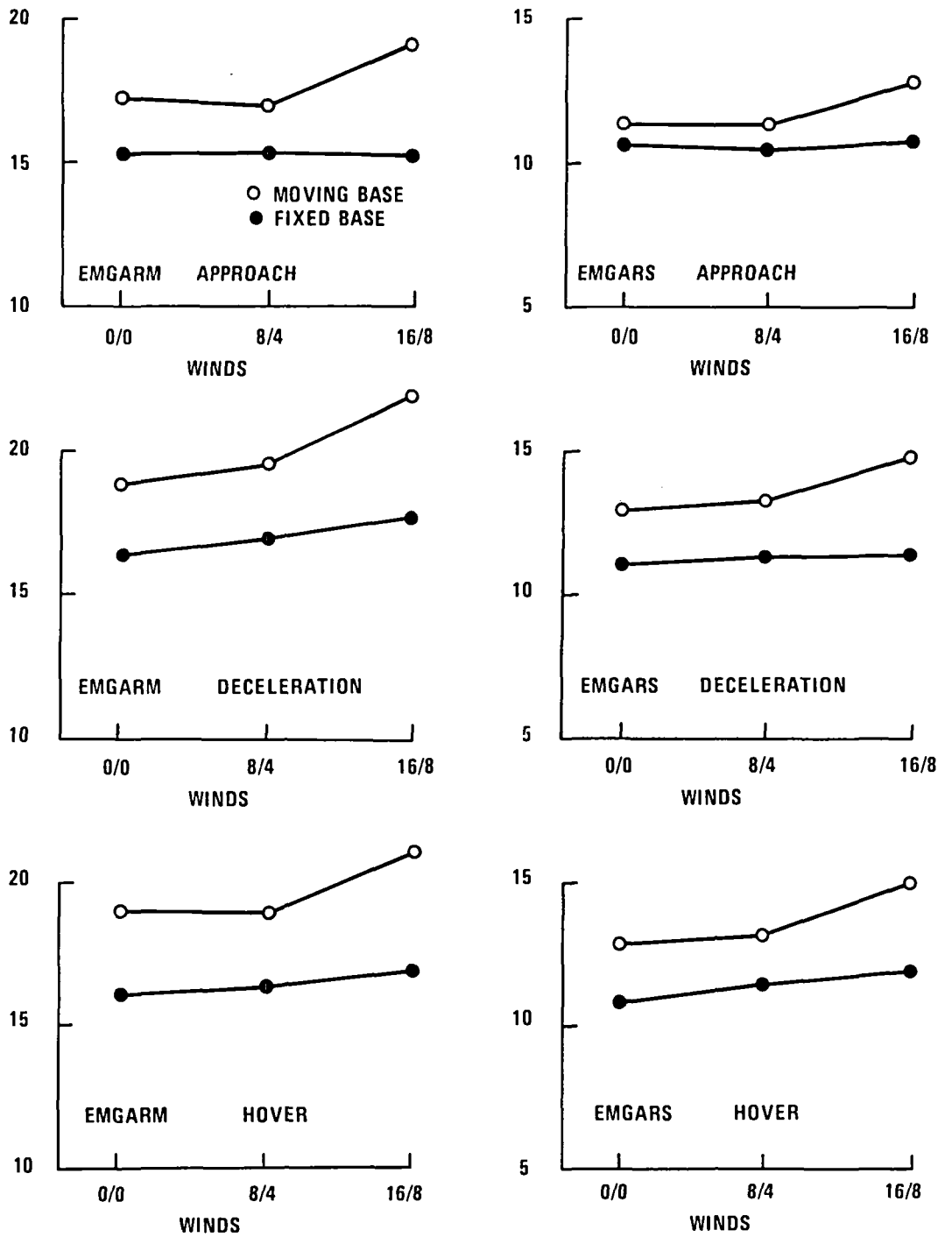


Figure 11. EMGARM and EMGARS (Arbitrary Units) Changes Over Wind and Motion Conditions for Approach, Deceleration, and Hover

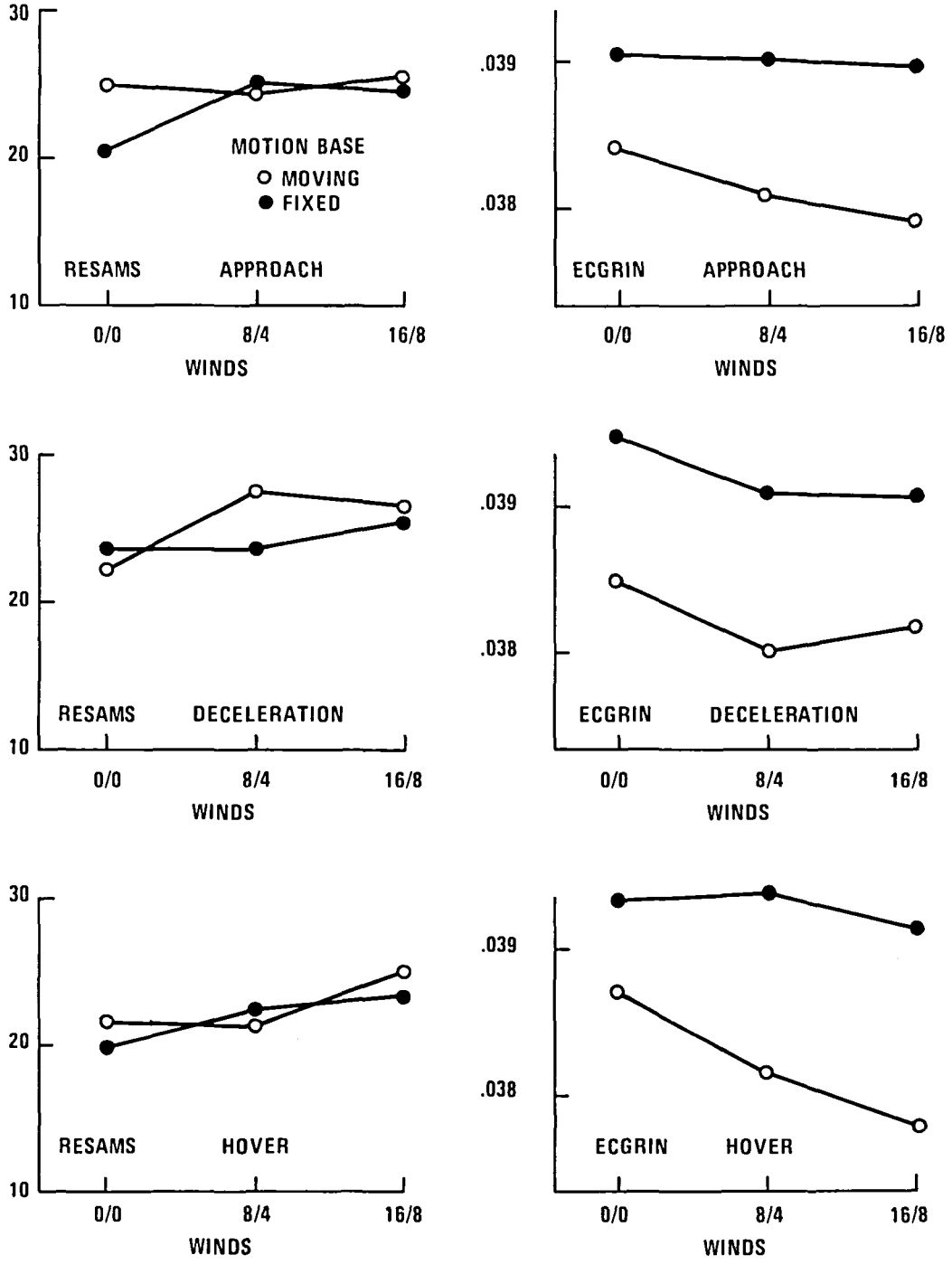


Figure 12. RESAMS (in cm) and ECGRIN (Arbitrary Units) Changes Over Wind and Motion Conditions for Approach, Deceleration, and Hover

condition. With the motion system on, certain arm movements may be greater because the pilot is working harder to keep the system stable.

Respiration amplitude/deviation has been found to be positively related to workload level in previous studies.[4, 5, 6, 7, 8, 18] This finding was consistent with the amplitude deviation variable (RESAMS) across winds. Deviations in breathing increased with increasing wind velocity conditions.

Heart rate (time interval), reflected in r-r mean interval (ECGRIN), was sensitive to wind increases directly supporting previous work by Stackhouse.[6]

In general, physiological measures differentiate motion vs. no motion and the high crosswind condition from the other two wind conditions, particularly in the motion condition case.

Flight Performance Variables--Fourteen flight performance variables were recorded on each landing approach trial. These included conventional error measures, stick positions, and acceleration amplitudes. A complete listing of these 14 variables was shown in Table 2.

Table 5 shows results of univariate analyses of variance tests on all 14 measures. Note that significance is indicated by the presence of a flight segment number; absence indicates non-significance. For example, heading error was significant for flight segments 2 and 3 for the main effect of displays.

Displays: Significant effects across flight segments produced the orders of merit indicated below for these displays. Listing of displays is from lowest to highest error or low to high accelerations. Listing of variables is in descending order of significane of these variables.

Table 5. Summary of Univariate Analyses of Variance on Flight Performance Measures[a]

| Variable | Experimental Effect | | | | | | |
|---|---|---|---|---|---|---|---|
| | Displays (D) | Winds (W) | Motion (M) | (Interactions) DW | DM | WM | DWM |
| Pitch error | 123 | 123 | | | | | |
| Roll error | | 123 | | | | 23 | |
| Power error | | | | | | | |
| Heading error | 23 | 123 | 1 | 1 | | | |
| Roll acceleration | 123 | 123 | 23 | | | 3 | |
| Pitch acceleration | 123 | 123 | 123 | | 123 | 2 | |
| Yaw acceleration | | 123 | 23 | | | | 2 |
| Speed error | 3 | 123 | 1 | | | 3 | 1 |
| Pitch position | | 23 | | | | | |
| Roll position | | 123 | 1 | | | | |
| Yaw position | 3 | 13 | 12 | | | | 1 |
| Power setting | | 1 | 13 | | | | 2 |
| Altitude error | | 123 | 2 | | | 3 | 2 |
| Crosstrack error | | 23 | 3 | | | | |

[a]Flight segments represented by number (1 = approach, 2 = deceleration, 3 = hover); significance level is $p \leq .05$, unless segment is underscored, indicating $p \leq .01$.

| Variable | Order of Merit |
|---|---|
| Roll acceleration | GRAPHIC I, GRAPHIC II, F-DIR |
| Pitch acceleration | GRAPHIC I, GRAPHIC II, F-DIR |
| Heading error | GRAPHIC I, GRAPHIC II, F-DIR |
| Pitch error | F-DIR, GRAPHIC I, GRAPHIC II |
| Airspeed error | F-DIR, GRAPHIC I, GRAPHIC II |

For pitch acceleration, GRAPHIC II and F-DIR were virtually equal.

The GRAPHIC I display outperformed the F-DIR on four performance scores. The difference might have been more pronounced if the test subjects had had equal prior experience on all displays. Most of the subjects were experienced on the conventional flight director, and had little experience on the computer generated displays.

Winds: Winds produced highly significant and consistent effects across segments and variables. Increasing wind produced increasing error or accelerations in all cases.

Motion: The effect of motion occurred about equally across segments. Airspeed error was lower with the fixed base system. Heading error showed the opposite effect.

Roll and pitch accelerations decreased in the fixed base condition in deceleration and hover segments. Yaw accelerations decreased with the moving base in these segments.

Interactions: Interactions were generally inconsistent across segments and variables. Pitch acceleration consistently showed an interaction in the display X motion conditions. The accelerations were much greater with the F-DIR/moving base condition vs. the F-DIR/fixed base condition. The other displays did not show as great a difference between fixed and moving base conditions. In the no-motion case, the GRAPHIC II and F-DIR were similar.

Visual Response Measures--Seven visual response measures were recorded on each trial. A complete listing of these measures is shown in Table 3. Table 6 summarizes the univariate analyses of variance on these measures.

Table 6. Summary of Univariate Analyses of Variance on Visual Response Measures[a]

| | Experimental Effect | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | Displays (D) | Winds (W) | Motion (M) | (Interactions) DW | DM | WM | DWM |
| SACCLM | 123 | | | | | | |
| SACCLS | | | | | | | |
| DWELLM | 123 | | 123 | | 123 | | |
| DWELLS | 123 | | 123 | | 123 | | |
| FIXRATE | 123 | 123 | 123 | | 123 | 13 | |
| BLINKR | 3 | 1 | 123 | | | | |
| PUPILD | 12 | | 123 | | 123 | | |

[a]Flight segments represented by number (1 = approach, 2 = deceleration, 3 = hover); significance level is $p \leq .05$, unless segment is underscored, indicating $p \leq .01$.

Displays: Several consistent results were observed for these measures:

- DWELLM was highest in GRAPHIC II condition.
- FIXRATE was lowest in GRAPHIC II condition.
- BLINKR was highest in GRAPHIC II condition.
- PUPILD was highest in GRAPHIC II condition, and lowest in the F-DIR condition. GRAPHIC I was intermediate in value on this variable.

Winds: Winds only produced a significant change in FIXRATE which increased with increasing gust amplitudes in all flight segments.

Motion: The following results were highly consistent across flight segments:

- DWELLM, DWELLS, and PUPILD were significantly larger in the fixed base condition.
- BLINKR, FIXRATE were significantly larger in the moving base condition.

Interactions: A consistently strong interaction appeared between motion and displays in all three segments for DWELLM, DWELLS, FIXRATE, and PUPILD measures. This interaction was traced to the fact that with the fixed base condition, DWELLM, DWELLS, and PUPILD means are all much larger with the GRAPHIC II display condition than the other two display conditions. Fixation rate was much smaller for the GRAPHIC II fixed base condition than the other two display conditions.

Discussion of visual measures: The literature on eye movement data and workload is highly discrepant and difficult to interpret.[19] In the present study, however, the long dwell times for the fixed base/GRAPHIC II display conditions would implicate this combination as involving higher visual workload. The GRAPHIC II display exhibited tendencies for poor flight performance as well, implicating it as a high workload condition. A plausible explanation is that this display requires longer focuses of attention to integrate information necessary for the flight task.

Fixation rate, inversely proportional to dwell mean time, showed the same trend in the fixed base/GRAPHIC II conditions. Krebs and Wingert[16] have shown that fixation rate increases over increasing difficulty conditions as defined by wind velocity. This is somewhat contradictory with the fact that fixation rate was substantially lower in the GRAPHIC II display condition found to be highly demanding by other measures. It is important to note that there may be certain interactive effects between methods of manipulating workload. Wind as a difficulty manipulator may have contradictory effects on visual movements to that of difficulty changes produced by different displays. Display differences may be caused by required focusing of visual attention to interpret changes tending to decrease fixation rate.

The long saccade length distances in the F-DIR and GRAPHIC I displays compared to short travel in the GRAPHIC II condition also indicates a general focusing of visual attention for the GRAPHIC II display not required with the other displays.

Pupil diameter has been shown to increase with increasing attention or workload demand.[20] PUPILD increased in the present study under the GRAPHIC II

display, fixed base conditions, again implicating this set of conditions as a high workload demand case.

Thus, eye movement measures seem difficult to interpret for a given set of flight conditions such as were tested in the present study. The particular information requirements of the displays have an important impact on the way in which the pilot receives and uses visual information.

## Correlation

As previously discussed, physiological, performance, and visual response measures were combined to form a group of 42 dependent scores for each trial. These 42 scores were submitted to a correlation analysis with total N of 540 per measure (all data points in the study).

The correlation matrices for the 42 dependent measures are presented in Appendix B for the three flight segments. The following discussion summarizes the correlation between the major data groups.

Physiological vs. Performance Measures--The following consistent trends apply across flight segments:

- EMG measures, particularly right arm measures, show relatively high positive correlation (+.2 to +.5) with the major flight performance error scores (PITCH, ROLL, POWER, HEADING, SPEEDER, ALTERR).
- Respiration duration and amplitude tend to be negatively correlated with error performance although the result lacks total consistency across segments.

- ECG measures (heart rate, mean amplitude, mean duration) show slight negative correlation with error performance. This result was consistent across segments. Intuitively, this result indicates that lower heartbeat rates and amplitudes tend to be associated with lower performance error.

Visual Response vs. Performance Measures--No consistent relationships were produced between visual response measures and error performance scores.

Physiological vs. Visual Response--

- Several strong relationships were observed between PUPILD and ECG measures.
- SACCLM and SACCLS showed moderate positive relationships with EMGARM and EMGARS measures.
- The balance of visual response measures were not correlated highly with physiological parameters.

## Multiple Discriminant Functions

The multiple discriminant weights shown in Table 7 indicate:

- $D_p$, formed from performance scores only, produced generally consistent weightings across segments for the performance variables. The first segment, approach, is highly dominated by YAWACC. The second segment, deceleration, is dominated by heading error, roll accelerations and roll stick position information. The hover segment is chiefly dominated by stick information in yaw and roll. YAWACC and crosstrack error also contributed to the discriminant function.

## Table 7. Discriminant Function Coefficients

| | Segment | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Approach | | | Deceleration | | | Hover | | |
| Variable | $D_p$ | $D_v$ | $D_{pv}$ | $D_p$ | $D_v$ | $D_{pv}$ | $D_p$ | $D_v$ | $D_{pv}$ |
| OPINION | +.08 | | +.14 | -.06 | | +.09 | +.05 | | -.08 |
| PITCH | -.03 | | -.04 | +.01 | | -.04 | -.11 | | -.10 |
| ROLL | -.01 | | -.02 | +.06 | | +.06 | +.08 | | +.08 |
| POWER | +.17 | | +.18 | +.16 | | +.14 | +.09 | | +.07 |
| HEADING | -.01 | | -.01 | +.44 | | +.44 | +.02 | | +.03 |
| ROLLAC | +.27 | | +.22 | +.25 | | +.38 | +.02 | | +.03 |
| PITCHAC | -.22 | | -.19 | -.10 | | -.11 | +.08 | | +.08 |
| YAWACC | +.84 | | +.82 | -.02 | | -.05 | +.19 | | +.20 |
| SPEEDER | -.06 | | -.06 | -.07 | | -.08 | +.03 | | +.03 |
| S/PITCH | -.20 | | -.20 | +.10 | | +.11 | -.13 | | -.12 |
| S/ROLL | +.12 | | +.09 | -.65 | | -.64 | -.69 | | -.69 |
| S/YAW | -.12 | | -.07 | +.33 | | +.31 | +.57 | | +.57 |
| POWSET | +.26 | | +.25 | +.28 | | +.26 | +.27 | | +.28 |
| ALTERR | -.08 | | -.10 | -.03 | | -.02 | +.03 | | +.04 |
| CXERR | -.01 | | -.01 | +.00 | | +.01 | +.15 | | +.15 |
| | | | | | | | | | |
| SACCLM | | +.25 | +.06 | | +.32 | +.10 | | +.27 | -.01 |
| SACCLS | | -.31 | -.00 | | -.42 | -.06 | | -.36 | +.01 |
| DWELLM | | -.27 | +.09 | | -.36 | -.06 | | -.43 | -.05 |
| DWELLS | | +.29 | -.12 | | +.25 | -.01 | | +.32 | -.00 |
| FIXRATE | | +.82 | +.25 | | +.72 | -.01 | | +.71 | -.10 |
| BLINKR | | +.10 | -.10 | | +.07 | +.01 | | +.07 | -.01 |
| PUPILD | | +.06 | -.01 | | +.04 | .00 | | +.04 | +.02 |

Opinion scores were positively weighted in the first and third segments, and negatively weighted in the second segment.

- $D_v$, formed from visual response data, produced highly consistent weightings across segments. Fixation rate dominated in all three segments although other variables were strong contributors (that is, SACCLM, SACCLS, DWELLM, DWELLS).

- $D_{pv}$, formed from both visual response and flight performance data, shows clear dominance by the performance data scores. Magnitudes of the discriminant weights for performance variables were relatively unchanged, while the visual response weights drop drastically. Fixation rate remained a relatively strong contributor to the approach function.

All of the discriminants significantly separated the 18 conditions in the 3 x 3 x 2 design. Data was collapsed over subjects and replications for this analysis, giving 30 data points for each condition ($p \leq .01$ as evaluated by Rao's criterion).[21]

Condition Centroids--The effect of multiple discriminant analysis on the data with respect to its ability to separate different experimental conditions can be observed by plotting the various condition centroids on the resultant discriminant scale. Centroids correspond to means of each condition on the discriminant scale. They are computed by multiplying the mean of each variable for a given condition by the discriminant weight for that variable. The resultant values are summed to form the condition centroid.

Figures 13 and 14 show the distribution of centroids. Figure 13 shows the distribution of the entire 18 experimental conditions on discriminant scales $D_p$ and $D_v$. The figure shows that:

- The flight performance based discriminant, $D_p$, separates different wind conditions and generally does not separate display/motion conditions. Some separation of F-DIR from the other displays was evident in approach and deceleration segments. These results are generally consistent with the univariate tests on the flight performance variables. The grand centroids for the three wind conditions are shown in Figure 14.

- The visual response discriminant, $D_v$, separates motion and display conditions. Note that moving base conditions are generally positive in value on this scale, while fixed base conditions fall below 0. The GRAPHIC II display conditions with motion tend to be grouped at the low end of the scale. This is consistent with the univariate interactions discussed above. This moving vs. fixed base differentiation is clearly projected in the grand centroids for $D_v$, shown in Figure 14. The nine moving and nine fixed base conditions are completely separated by the horizontal line in the three segments.

  Within a motion condition, there is also clear discrimination between display conditions. F-DIR and GRAPHIC I displays were about equal, and GRAPHIC II was distinctly different. The difference between these display centroids was not as pronounced in the motion base condition, however.

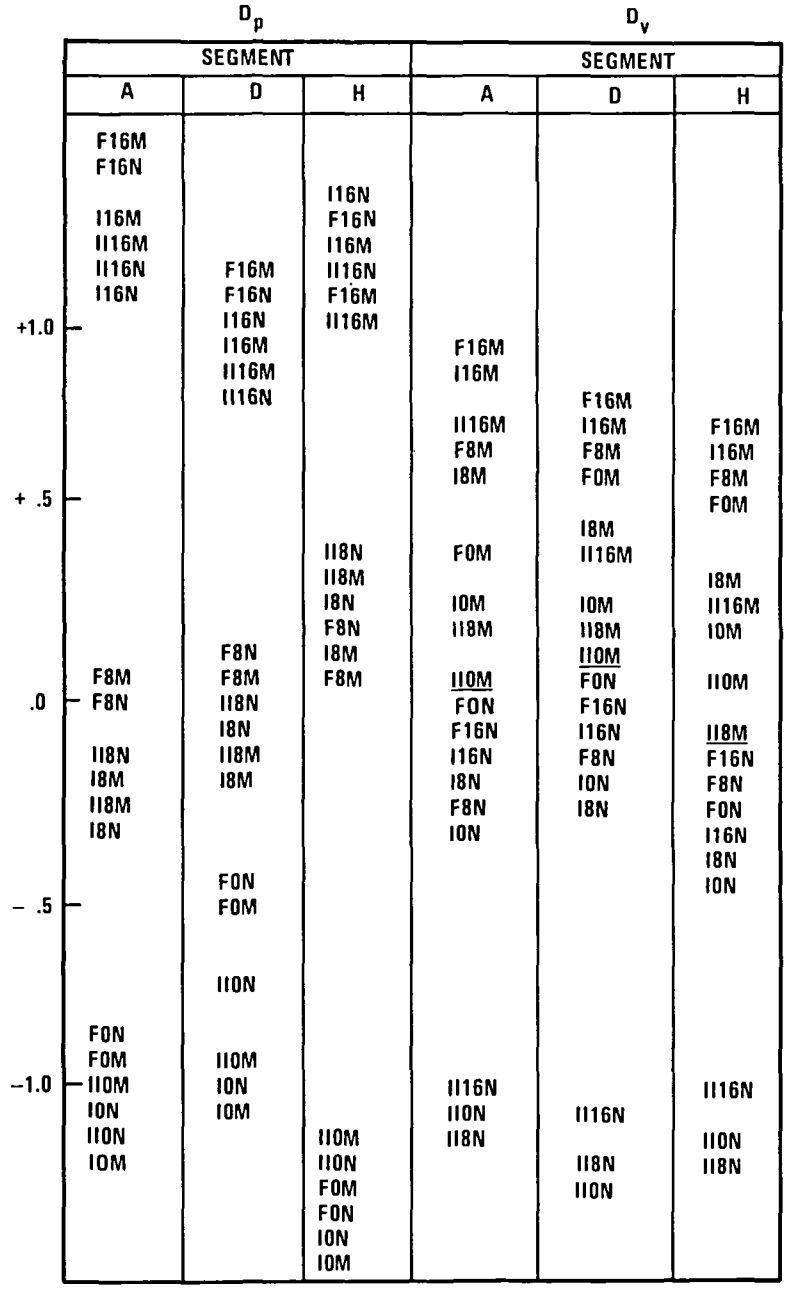


Figure 13. Group Centroids for $D_p$ and $D_v$ (Note: First designator indicates displays: F = F-DIR, I = GRAPHIC I, II = GRAPHIC II; second designator indicates wind: 0 = 0/0, 8 = 8/4, 16 = 16/8; and third designator indicates motion: M = moving, N = fixed base.)

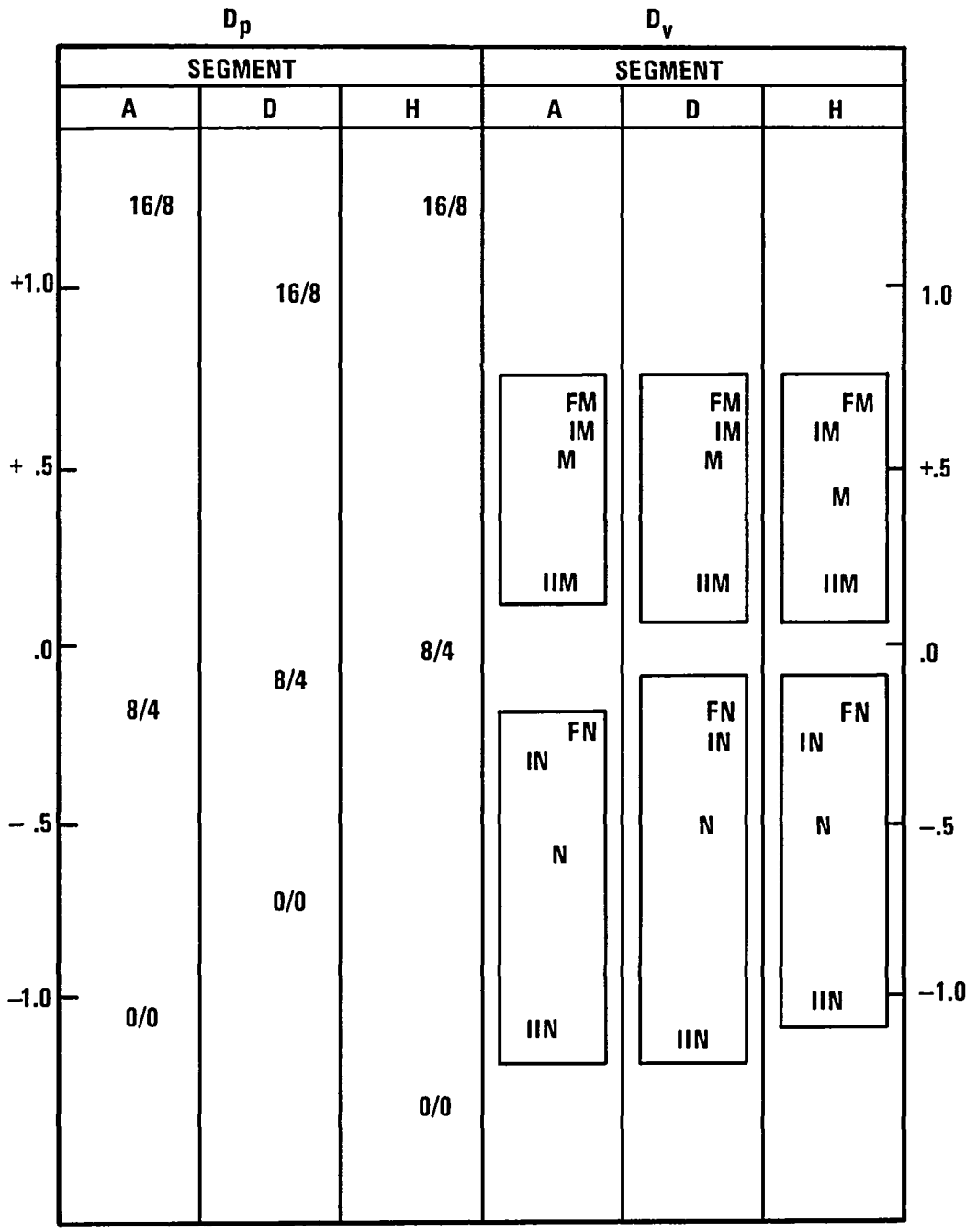


Figure 14. Grand Centroids for Wind Conditions in $D_p$ and Motion Base/ Display Conditions in $D_v$ (Note: M and N indicate position of grand centroids for moving and fixed base; F, I, and II prefixes are display centroids for the indicated motion base condition.)

## Multiple Regression

Three prediction cases will be presented out of the five indicated in Section 3.

- Physiological measures plus oculometer measures predicting $D_p$ (flight performance/opinion score discriminant)
- Physiological measures predicting $D_v$ (visual data discriminant)
- Physiological measures predicting the combined discriminant $D_{pv}$, formed from both flight performance/opinion and oculometer measures

The remaining two cases are not presented because they either produced nearly identical results with one of the above (physiological predicting $D_p$) or did not produce significant prediction equations (oculometer measures predicting $D_p$).

Table 8 shows the prediction coefficients obtained in the stepwise analyses. A blank entry indicates either removal or non-entry of that predictor variable into the equation.

Several features of these prediction weights are evident:

- For all cases, there are few inconsistencies in weightings across flight segments for the largest contributors.
- Considering the $D_p$ discriminant as our criterion, high $D_p$ scores are produced by: 1) high left EMG activity amplitude with low standard deviation (EMGALM, EMGALS), 2) low respiration amplitudes with high standard deviation (RESAMP, RESAMS), 3) low duration heartbeat, for example, high rates (ECGRDM), 4) low ECGS/R ratios, high "p" intervals (ECGPIN), 5) high fixation rates (FIXRATE), and 6) high pupil diameter score (PUPILD).

## Table 8. Standardized Multiple Regression Coefficients

| | Approach | | | Deceleration | | | Hover | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | $D_p$ | $D_v$ | $D_{pv}$ | $D_p$ | $D_v$ | $D_{pv}$ | $D_p$ | $D_v$ | $D_{vp}$ |
| ENGARM | 0.02 | 0.14 | 0.01 | 0.22 | 0.19 | 0.25 | -0.07 | 0.35 | -0.10 |
| EMGARS | -0.07 | -0.16 | -0.08 | -0.08 | -0.07 | -0.10 | 0.10 | -0.12 | 0.08 |
| EMGALM | 0.56 | -0.04 | 0.53 | 0.46 | | 0.39 | 0.44 | -0.26 | 0.46 |
| EMGALS | -0.46 | 0.07 | -0.44 | -0.57 | -0.12 | -0.50 | -0.26 | 0.08 | -0.33 |
| RESAMP | -0.15 | 0.09 | -0.13 | 0.04 | 0.09 | 0.09 | -0.16 | -0.07 | -0.14 |
| RESAMS | 0.24 | 0.04 | 0.21 | 0.15 | 0.05 | 0.14 | 0.19 | 0.15 | 0.20 |
| RESPDM | 0.03 | -0.32 | -0.05 | -0.14 | -0.29 | -0.16 | 0.08 | 0.02 | 0.07 |
| RESPDS | -0.14 | 0.27 | -0.05 | 0.08 | 0.26 | 0.10 | -0.09 | 0.03 | -0.12 |
| ECGRAM | 0.07 | -0.09 | 0.07 | -0.14 | -0.21 | -0.15 | -0.11 | -0.16 | -0.07 |
| ECGRAS | 0.04 | -0.00 | 0.03 | | 0.04 | | 0.01 | 0.13 | 0.02 |
| ECGRDM | -0.15 | 0.03 | -0.15 | -0.06 | 0.09 | -0.05 | -0.20 | | -0.23 |
| ECGRDS | -0.02 | 0.04 | 0.00 | 0.01 | 0.06 | 0.04 | 0.06 | 0.17 | 0.05 |
| ECGP/R | 0.07 | 0.12 | 0.07 | 0.08 | 0.03 | 0.07 | 0.02 | 0.24 | |
| ECGQ/R | -0.01 | 0.14 | | 0.04 | 0.17 | 0.01 | 0.08 | 0.20 | -0.02 |
| ECGS/R | -0.14 | -0.09 | -0.13 | -0.17 | -0.08 | -0.17 | -0.09 | -0.21 | -0.10 |
| ECGT/R | 0.11 | 0.03 | 0.14 | 0.11 | 0.07 | 0.16 | 0.23 | 0.18 | 0.26 |
| ECGPIN | 0.16 | 0.07 | 0.19 | 0.12 | 0.10 | 0.15 | | 0.10 | 0.02 |
| ECGQIN | | 0.18 | 0.03 | 0.12 | 0.08 | 0.10 | 0.02 | 0.15 | |
| ECGRIN | 0.11 | -0.01 | 0.06 | 0.07 | -0.08 | 0.07 | -0.10 | -0.08 | -0.06 |
| ECGSIN | 0.06 | 0.01 | 0.04 | 0.10 | -0.08 | 0.08 | 0.05 | -0.13 | 0.08 |
| ECGTIN | 0.19 | 0.18 | 0.18 | 0.02 | 0.26 | 0.07 | -0.02 | 0.27 | |
| SACCLM | 0.16 | | | 0.12 | | | 0.05 | | |
| SACCLS | -0.07 | | | -0.16 | | | -0.19 | | |
| DWELLM | 0.14 | | | 0.11 | | | 0.06 | | |
| DWELLS | -0.06 | | | | | | 0.01 | | |
| FIXRATE | 0.18 | | | 0.14 | | | 0.14 | | |
| BLINKR | 0.13 | | | -0.06 | | | -0.00 | | |
| PUPILD | 0.14 | | | 0.15 | | | 0.18 | | |
| R | .41 | .43 | .33 | .40 | .45 | .37 | .31 | .50 | .27 |

- Considering the $D_v$ prediction case as our criterion, high scores are produced by: 1) high right arm EMG amplitude and low standard deviations (EMGARM, EMGARS), 2) low left arm EMG amplitude during hover (EMGALM), 3) low respiration rate with high values of standard deviation (RESPDM, RESPDS), 4) low amplitude heartbeat (ECGRAM) in deceleration and hover, and 5) high ECGQ/R ratio and low ECGS/R ratio, high ECGQIN, and high ECGTIN values.

The interpretation of the weightings is primarily speculative although several of the weights in case $D_p$ above are logical. Recalling that $D_p$ is highly sensitive to the wind condition changes acting as the difficulty forcing function, it appears that high workload level is characterized by high muscle activity, high heart rate, irregular respiration rate, high fixation rate (more fixations per time interval), and high pupil diameter.

Several of the predictors change magnitude, and in some cases sign in the $D_v$ equation during the hover segment. This result suggests that the operational requirements in hover, particularly in the acquisition strategy for visual information, may be different.

The multiple regression coefficients, although statistically significant, appear to be rather low. It must be remembered that the data submitted to this analysis included variance caused by the five replications for each subject. Day-to-day changes in performance caused by motivation, fatigue, etc., contribute to this variance. If this variance were removed by collapsing across replications, the predictive power of the equations would appear substantially higher.

Predictive Relationships--The relationship between the scores attained on the discriminant scales and scores predicted by the physiological variables is the basis for examining the capability of physiological measures to measure workload. For the $D_p$, the discriminant scale can be interpreted as a scale of task difficulty because wind amplitude conditions were maximally separated by these variables. In Figure 15, we have plotted the centroids of the 18 conditions on $D_p$ against the 18 centroids predicted using the regression coefficients and the physiological variables. Note that the three wind conditions are clearly separated by the D scale, as indicated earlier. The three lines indicate the consistent linear relationship between the physiological measures and the performance measures across these changes in task difficulty.

Figure 16 shows a similar relationship. However, as previously indicated, the $D_v$ maximized differences between motion conditions. The physiological scale maintains the general separation between motion and fixed base conditions. Grand centroids have been plotted to highlight this feature.

Opinion Data--Because opinion data was collected only in the display/motion combinations and not evaluated for the three wind conditions, its overall applicability is somewhat limited in the present experiment. The mean ratings across the six subjects are presented in Table 9.

Although an analysis of variance was not performed on this data due to the small sample size, it is evident that the GRAPHIC I display was considered to be the least demanding on workload for the three displays compared. Although subjects were inconsistent in their ratings of F-DIR and GRAPHIC II displays, they consistently gave the GRAPHIC I display a lower workload rating than the other two displays.

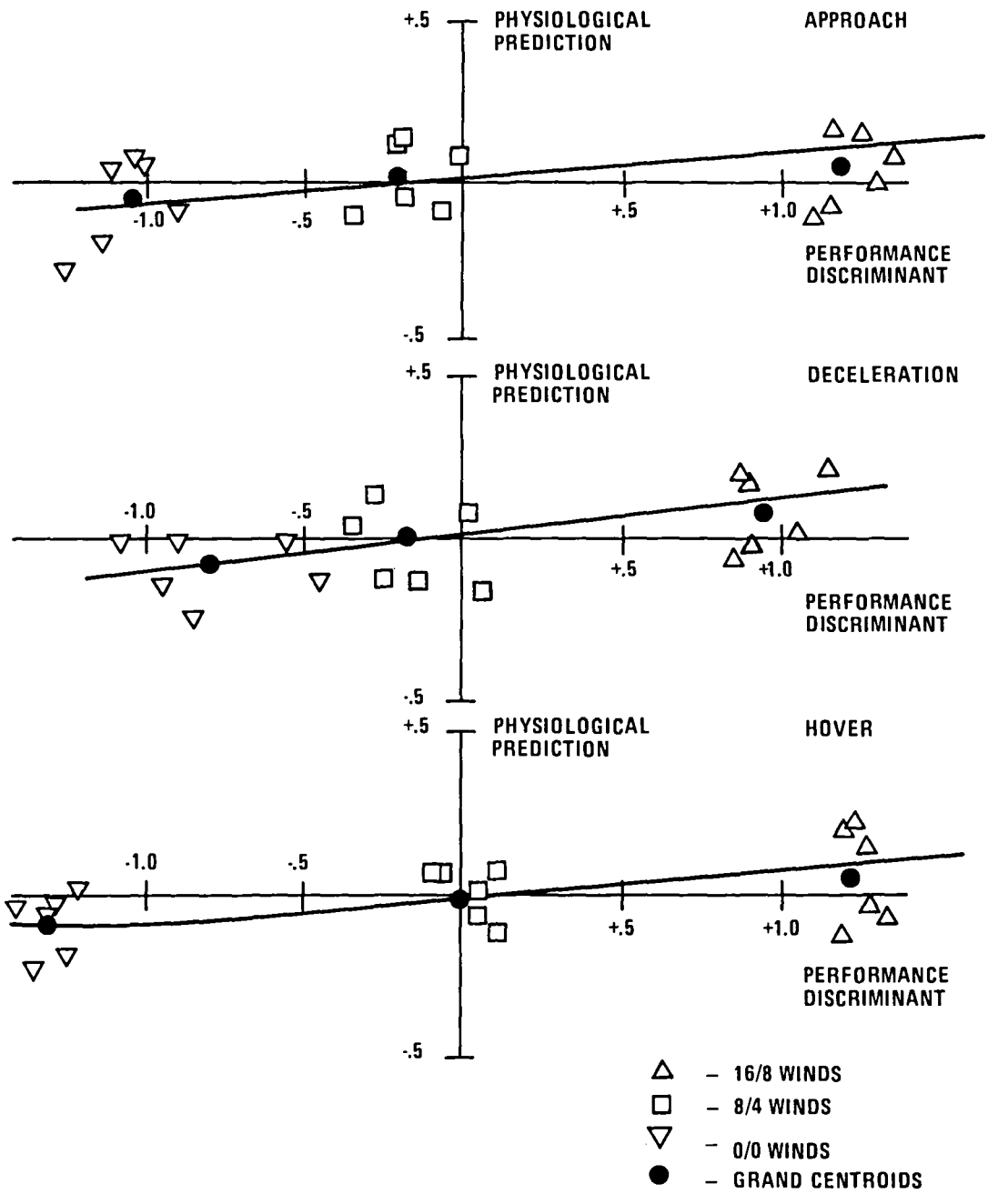


Figure 15. Prediction of Workload (Performance Discriminant) by Physiological Variables Showing Position of Predicted vs. Actual Condition Centroids

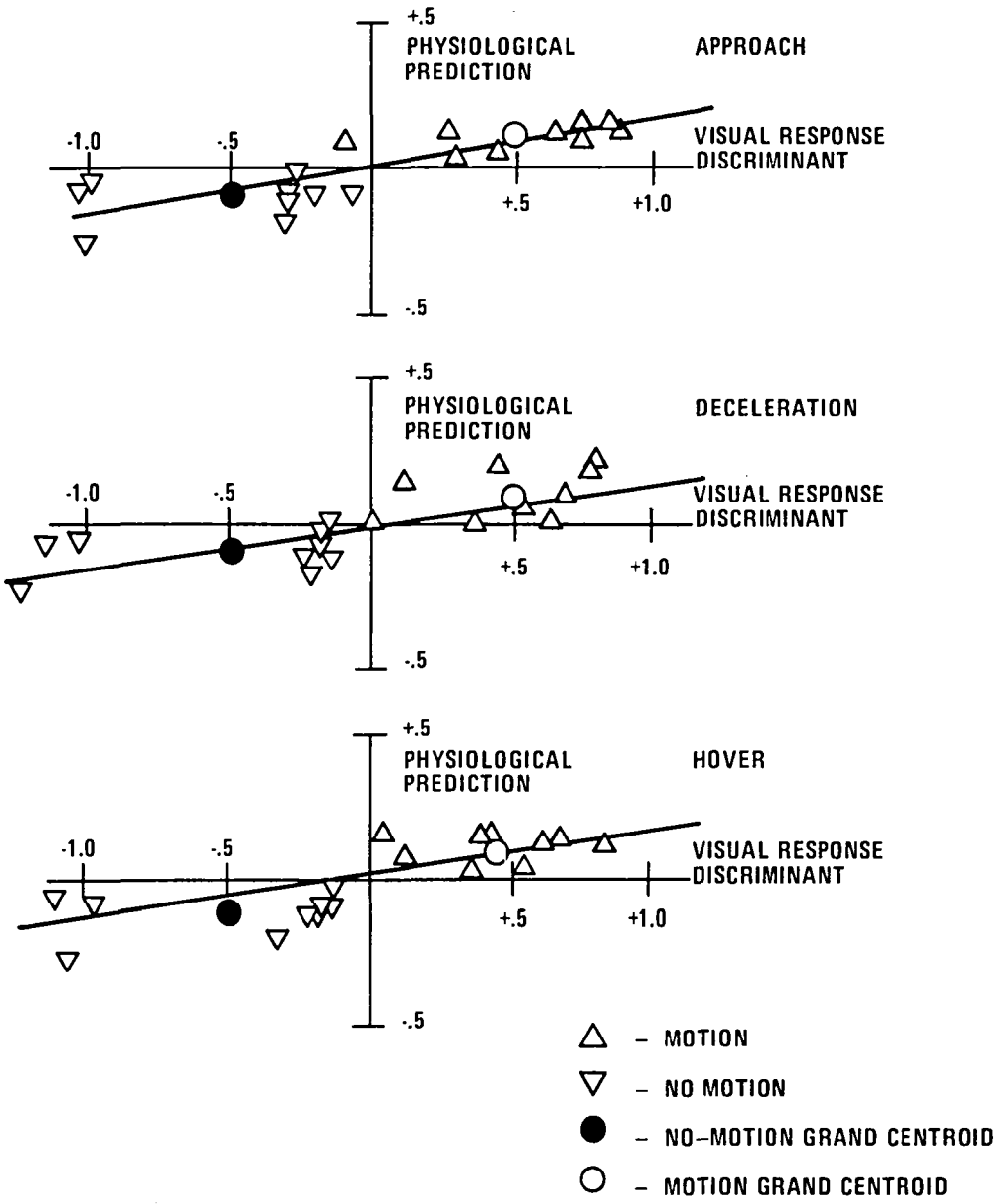


Figure 16. Prediction of Visual Response Measure Discriminant by Physiological Variables Showing Positions of Predicted vs. Actual Condition Centroids

Table 9. Workload Opinion Data Means Over Motion/Display Combinations

| | Displays | | |
|---|---|---|---|
| | GRAPHIC I | GRAPHIC II | F-DIR |
| Moving base | 3.95 | 5.33 | 5.38 |
| Fixed base | 4.20 | 5.75 | 6.04 |

Motion base evaluation demonstrated a small but consistent preference in favor of the motion base condition.

Appendix C contains raw data for the rating scales across subjects, motion, and display conditions.

Opinion data corresponded with general order-of-merit findings within display conditions assessed by the flight performance measures. GRAPHIC II was considered to impose highest workload compared to the other displays, and this is partially substantiated by several flight performance scores. Order-of-merit between GRAPHIC II and F-DIR displays was unclear in both opinion and flight performance scores, however.

Workload estimation of moving vs. fixed base conditions were, as indicated, less clear. Performance data also showed generally non-significant differences between fixed base and motion base conditions.

# SECTION 5

# CONCLUSIONS

The results of this study have demonstrated the success of applying physiological measures as predictors of workload provided with comparative data related to flight performance with conventional and graphic VTOL landing displays, suggested utility for both visual response data, and pilot opinion scores.

## Workload Prediction

This study provides further support for the predictive relationship between physiological measures and workload level. Multiple discriminant analysis was successfully applied to conventional flight performance scores deriving a scale that produced maximum separation of conditions known to impose different workload levels. Stepwise multiple regression revealed physiological measures that successfully predicted scores on this scale. Visual response scores did not add new information to this predictive relationship. A summarization of the prediction equations for the three flight segments is shown in Table 10. The major coefficients are included for each segment.

EMG Measures--EMG left arm amplitude and deviation appear to be important predictors of workload in VTOL approaches. This relationship appears consistent across all three flight segments. High activity (arm tension) with low deviation indicates a high workload condition. This result is not surprising, since the left arm was controlling altitude performance. Therefore, left arm EMG may be a specific predictor associated with landing tasks of this sort.

Table 10. Major Regression Weights for Workload Prediction from Physiological Variables

| | Approach | Deceleration | Hover |
|---|---|---|---|
| EMGALM | +.53 | +.39 | +.46 |
| EMGALS | -.44 | -.50 | -.33 |
| RESAMP | -.13 | | -.14 |
| RESAMS | +.21 | +.14 | +.20 |
| RESPDM | | -.16 | |
| ECGRAM | | -.15 | |
| ECGRDM | -.15 | | -.23 |
| ECGS/R | -.13 | -.17 | |
| ECGT/R | +.14 | +.16 | +.26 |
| ECGPIN | +.19 | +.15 | |
| ECGTIN | +.18 | | |

Respiration Measures--In approach and hover, high workload is indicated by shallow (low amplitude) and irregular (high deviation) breathing, and in deceleration by a higher respiration rate.

ECG Waveforms--Amplitude of the ECG waveform was negatively related to workload only in the deceleration segment. The duration was negatively related in the approach and hover segments. Heart rate, therefore, appears positively related to workload in these segments.

Low ratios of R to S amplitudes in the ECG wave suggest high workload in approach and deceleration, as does high T to R duration (all segments), and P interval (approach and deceleration). Longer T intervals suggest high workload in approach to landing only.

Thus, physiological variables showed an order-of-merit with respect to consistency across segments. EMG measures appear to be most generalizable across flight situations, followed by respiration measures, and ECG waveform measures. In general, this result is consistent with previous workload studies in this series.[4, 5, 6, 7, 8]

## Visual Response Data

Visual response measures appear highly sensitive to both display and motion base conditions, as indicated by the examination of individual measures and multivariate discriminant analyses. In general, the moving base condition is characterized by frequent eye movements, while the fixed base condition tends to slow movement down and increase dwell time. The effect of displays on these measures is consistent. The GRAPHIC II display exhibits different visual response under the fixed base condition; pilots are required to make more frequent shifts in visual attention (higher fixation rate, low dwell times). The GRAPHIC II display is also characterized by shorter movements of the eyes over both motion conditions.

It is difficult to relate the special properties of these visual measures to workload level because little is actually known of the relationship from previous work. It is concluded, however, that visual response data can be of interest in determining the special visual data acquisition strategies used by pilots in different flight situations.

## Display Comparisons

The following conclusions are made concerning the three displays evaluated in this study:

- Displays were different with regard to performance as measured by conventional flight performance variables. These differences, however, were not consistent in their orders of merit. Motion tended to attenuate the display differences.
- Displays were not well discriminated by physiological measures suggesting difficulty in the use of such measures to determine the workload imposed by different displays.
- Displays were well discriminated by visual response data as indicated previously. Again, motion lessened the effect of the three display conditions.

With regard to the particular orders of merit of the three displays tested in this study, the following conclusions and recommendations are offered:

- The conventional flight director is superior to graphically produced displays for maintaining pitch command and altitude command (especially during hover). The flight director is also better for maintaining airspeed command. The flight director is clearly inferior to the graphic type displays in maintaining heading command.
- GRAPHIC I and flight director displays are superior to the GRAPHIC II display in maintaining altitude command.

- The GRAPHIC I display shows clear superiority to the other two displays in maintaining roll commands. It is also better at maintaining crosstrack in hover. Thus, the GRAPHIC I display seems to efficiently combine needed information although possible improvement could be offered in presenting airspeed and/or pitch command information.

## Motion Base Effects

Although the results of this study are unclear regarding the special workload properties of motion vs. no motion in the simulator as measured by physiological variables, several relationships are clear:

- Motion causes more arm movement, larger S amplitudes on ECG, larger respiration-amplitude values, and lower ECG R interval values.
- Motion tends to produce more accelerations during flight as would be expected. The relationship between error scores and motion is less clear with about the same performance for moving and fixed base cases. Crosstrack errors in hover were much less with the motion base condition, although this was the only strong effect produced.
- Visual responses of pilots are extremely different in moving vs. fixed base operation. The special properties of these responses were discussed previously.

## Opinion Scores

The Cooper-Harper method of rating workload was in general agreement with performance data on these displays. The six pilots in this study showed preference for the GRAPHIC I and F-DIR displays over GRAPHIC II. Because wind workload was not rated and segment ratings were combined, it is difficult to draw strong conclusions regarding the utility of opinion scores in this study.

# APPENDIX A

## CELL MEANS

SEGMENT 1 VARIABLE 1 EMGARM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 15.2069 | 16.1269 | 15.5010 |
| | 6.5427 | 6.9294 | 6.1021 |
| 8/4 | 15.0552 | 15.7399 | 15.2723 |
| | 5.9298 | 6.1079 | 5.7549 |
| 16/8 | 15.1233 | 16.3330 | 15.0084 |
| | 5.7828 | 6.2181 | 4.6873 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 16.3918 | 18.0330 | 16.9017 |
| | 7.1124 | 8.9223 | 6.1164 |
| 8/4 | 16.2275 | 19.0598 | 15.7796 |
| | 5.5395 | 8.4552 | 4.7357 |
| 16/8 | 17.8282 | 20.0369 | 18.6192 |
| | 6.0985 | 7.7725 | 5.2893 |

SEGMENT 1 VARIABLE 2 EMGARS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 10.5191 | 11.6249 | 10.4914 |
| | 4.6655 | 4.7997 | 4.2603 |
| 8/4 | 10.2503 | 10.7666 | 10.7328 |
| | 4.2548 | 4.5999 | 4.6818 |
| 16/8 | 10.6325 | 11.3269 | 10.5823 |
| | 4.4032 | 4.6169 | 3.9135 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 10.9243 | 12.2791 | 11.4911 |
| | 5.2231 | 6.3403 | 4.6560 |
| 8/4 | 10.9195 | 12.6291 | 11.0517 |
| | 4.3992 | 5.6690 | 3.5137 |
| 16/8 | 12.0653 | 13.7836 | 12.6237 |
| | 4.4848 | 5.9679 | 3.8263 |

SEGMENT 1 VARIABLE 4 EMGALR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 9.8187 | 10.4504 | 9.0608 |
| | 4.5435 | 4.5656 | 2.7694 |
| 8/4 | 10.1330 | 10.6714 | 8.9738 |
| | 4.4563 | 4.6859 | 3.0578 |
| 16/8 | 11.2125 | 11.8308 | 10.2260 |
| | 5.1402 | 5.8292 | 3.5794 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 10.3120 | 11.4609 | 10.4954 |
| | 5.9166 | 5.3257 | 4.0329 |
| 8/4 | 11.5722 | 12.1315 | 10.5575 |
| | 5.3621 | 5.9009 | 4.1538 |
| 16/8 | 12.9889 | 14.3553 | 11.5314 |
| | 5.8677 | 7.7215 | 4.8480 |

SEGMENT 1 VARIABLE 5 EMGALS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 7.5495 | 8.0197 | 7.0253 |
| | 4.1808 | 4.4014 | 2.9956 |
| 8/4 | 7.7457 | 7.6857 | 7.2477 |
| | 4.1872 | 3.8400 | 3.4581 |
| 16/8 | 8.4167 | 8.6459 | 8.0207 |
| | 4.6619 | 4.6778 | 3.7320 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 7.8899 | 8.4508 | 8.1093 |
| | 3.8334 | 4.4656 | 4.0033 |
| 8/4 | 8.6253 | 9.1160 | 8.3123 |
| | 4.4374 | 5.3218 | 3.7898 |
| 16/8 | 9.8985 | 10.8149 | 8.7689 |
| | 5.0530 | 6.4186 | 4.1189 |

SEGMENT 1 VARIABLE 7 RESAMP

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 142.4883 | 144.8005 | 142.8160 |
| | 59.8482 | 58.1689 | 62.8345 |
| 8/4 | 137.6760 | 140.2194 | 141.4391 |
| | 49.6981 | 49.6604 | 52.3072 |
| 16/8 | 144.3504 | 139.6439 | 139.6454 |
| | 54.7742 | 42.9388 | 52.5740 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 153.1032 | 150.8258 | 155.4891 |
| | 66.8102 | 61.0283 | 61.3548 |
| 8/4 | 150.3993 | 144.8264 | 149.4130 |
| | 54.0215 | 52.2683 | 52.9225 |
| 16/8 | 146.0271 | 146.3029 | 159.7920 |
| | 45.8889 | 43.3551 | 54.7019 |

SEGMENT 1 VARIABLE 8 RESAMS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 22.6105 | 20.2562 | 20.0712 |
| | 17.7852 | 17.9877 | 9.3433 |
| 8/4 | 22.9748 | 26.7189 | 27.3569 |
| | 11.2696 | 18.2320 | 19.3346 |
| 16/8 | 26.3093 | 22.5636 | 26.4813 |
| | 15.9595 | 8.2055 | 17.4244 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 26.1590 | 24.5786 | 25.1054 |
| | 16.5165 | 14.1118 | 10.7122 |
| 8/4 | 27.1324 | 25.2083 | 29.9429 |
| | 15.6377 | 15.5738 | 26.7543 |
| 16/8 | 30.9085 | 26.2425 | 31.7660 |
| | 19.5707 | 10.5280 | 24.1208 |

SEGMENT 1 VARIABLE 9 RESPDM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.6623 | 2.6856 | 2.6499 |
| | 0.3146 | 0.3683 | 0.2452 |
| 8/4 | 2.6526 | 2.6146 | 2.6806 |
| | 0.3605 | 0.3295 | 0.3410 |
| 16/8 | 2.6370 | 2.5376 | 2.6111 |
| | 0.3274 | 0.2895 | 0.3570 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.6171 | 2.4851 | 2.5415 |
| | 0.3301 | 0.2660 | 0.2651 |
| 8/4 | 2.5602 | 2.5259 | 2.4941 |
| | 0.2574 | 0.3541 | 0.3266 |
| 16/8 | 2.5105 | 2.5017 | 2.4776 |
| | 0.2886 | 0.2702 | 0.2614 |

SEGMENT 1 VARIABLE 10 RESPDS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2625 | 0.2149 | 0.2888 |
| | 0.1609 | 0.1153 | 0.1604 |
| 8/4 | 0.2733 | 0.3410 | 0.3156 |
| | 0.1762 | 0.2957 | 0.2671 |
| 16/8 | 0.2380 | 0.2240 | 0.3064 |
| | 0.1477 | 0.1489 | 0.2028 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3742 | 0.3145 | 0.3305 |
| | 0.2958 | 0.2977 | 0.2456 |
| 8/4 | 0.3907 | 0.3812 | 0.2901 |
| | 0.4887 | 0.4453 | 0.2188 |
| 16/8 | 0.3944 | 0.2475 | 0.2855 |
| | 0.6202 | 0.1571 | 0.2608 |

SEGMENT 1 VARIABLE 13 ECGRAM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 244.3571 | 243.0858 | 244.2068 |
| | 97.2290 | 97.1083 | 97.3518 |
| 8/4 | 242.2852 | 241.9905 | 242.5233 |
| | 95.7932 | 92.7979 | 96.6356 |
| 16/8 | 244.5755 | 243.6366 | 240.2243 |
| | 95.6142 | 94.4017 | 94.0532 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 245.0168 | 248.9073 | 250.6556 |
| | 95.8467 | 96.4890 | 97.6081 |
| 8/4 | 243.7814 | 244.7865 | 244.5066 |
| | 94.9800 | 94.3105 | 96.0142 |
| 16/8 | 243.0072 | 241.9210 | 244.3834 |
| | 93.6816 | 91.9546 | 94.5032 |

SEGMENT 1 VARIABLE 14 ECGRAS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 19.0484 | 19.0594 | 16.2699 |
| | 19.7372 | 20.5818 | 19.1394 |
| 8/4 | 15.9279 | 25.4867 | 19.2847 |
| | 17.2591 | 27.3174 | 20.6356 |
| 16/8 | 16.5522 | 20.2652 | 19.8372 |
| | 18.0953 | 21.7846 | 20.1181 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 25.8627 | 21.4384 | 16.2133 |
| | 28.3146 | 21.7097 | 18.0155 |
| 8/4 | 19.6521 | 22.2896 | 21.5361 |
| | 22.0640 | 26.3004 | 24.6398 |
| 16/8 | 20.9045 | 25.5834 | 20.7393 |
| | 20.5392 | 23.6301 | 20.7422 |

SEGMENT 1 VARIABLE 15 ECGRDM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7266 | 0.7218 | 0.7371 |
| | 0.1036 | 0.0880 | 0.0894 |
| 8/4 | 0.7201 | 0.7010 | .7382 |
| | 0.0812 | 0.0746 | .0877 |
| 16/8 | 0.7191 | 0.6980 | 0.7146 |
| | 0.0806 | 0.0796 | 0.0865 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7143 | 0.7134 | 0.7075 |
| | 0.1054 | 0.0907 | 0.1081 |
| 8/4 | 0.7046 | 0.6961 | 0.7006 |
| | 0.0852 | 0.0914 | 0.0945 |
| 16/8 | 0.6764 | 0.6847 | 0.6893 |
| | 0.0787 | 0.0767 | 0.0859 |

SEGMENT 1 VARIABLE 16 ECGRDS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0685 | 0.0887 | 0.0931 |
| | 0.0443 | 0.0530 | 0.0584 |
| 8/4 | 0.0879 | 0.0837 | 0.0768 |
| | 0.0459 | 0.0449 | 0.0369 |
| 16/8 | 0.0835 | 0.0832 | 0.0924 |
| | 0.0550 | 0.0327 | 0.0488 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0794 | 0.0850 | 0.0780 |
| | 0.0432 | 0.0512 | 0.0377 |
| 8/4 | 0.0960 | 0.0885 | 0.0923 |
| | 0.0520 | 0.0536 | 0.0577 |
| 16/8 | 0.0798 | 0.1005 | 0.0897 |
| | 0.0449 | 0.0549 | 0.0580 |

SEGMENT 1 VARIABLE 17 ECGP/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0074 | 0.0108 | 0.0104 |
| | 0.0314 | 0.0356 | 0.0299 |
| 8/4 | 0.0112 | 0.0112 | 0.0101 |
| | 0.0324 | 0.0298 | 0.0317 |
| 16/8 | 0.0103 | 0.0086 | 0.0123 |
| | 0.0341 | 0.0299 | 0.0318 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0164 | 0.0159 | 0.0146 |
| | 0.0351 | 0.0324 | 0.0334 |
| 8/4 | 0.0152 | 0.0216 | 0.0194 |
| | 0.0324 | 0.0363 | 0.0358 |
| 16/8 | 0.0202 | 0.0149 | 0.0161 |
| | 0.0337 | 0.0310 | 0.0374 |

SEGMENT 1 VARIABLE 18 ECGG/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1461 | -0.1501 | -0.1464 |
| | 0.0714 | 0.0768 | 0.0700 |
| 8/4 | -0.1482 | -0.1431 | -0.1460 |
| | 0.0748 | 0.0682 | 0.0677 |
| 16/8 | -0.1455 | -0.1389 | -0.1456 |
| | 0.0686 | 0.0669 | 0.0670 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1445 | -0.1518 | -0.1498 |
| | 0.0613 | 0.0686 | 0.0649 |
| 8/4 | -0.1475 | -0.1492 | -0.1476 |
| | 0.0655 | 0.0664 | 0.0613 |
| 16/8 | -0.1464 | -0.1491 | -0.1551 |
| | 0.0616 | 0.0638 | 0.0648 |

SEGMENT 1 VARIABLE 20 ECGS/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1711 | -0.1710 | -0.1749 |
| | 0.0640 | 0.0639 | 0.0649 |
| 8/4 | -0.1766 | -0.1725 | -0.1720 |
| | 0.0649 | 0.0592 | 0.0629 |
| 16/8 | -0.1717 | -0.1736 | -0.1705 |
| | 0.0563 | 0.0588 | 0.0568 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1727 | -0.1793 | -0.1740 |
| | 0.0649 | 0.0668 | 0.0613 |
| 8/4 | -0.1785 | -0.1761 | -0.1826 |
| | 0.0652 | 0.0671 | 0.0638 |
| 16/8 | -0.1850 | -0.1650 | -0.1831 |
| | 0.0673 | 0.0700 | 0.0672 |

SEGMENT 1 VARIABLE 21 ECG1/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1484 | 0.1478 | 0.1480 |
| | 0.0756 | 0.0785 | 0.0700 |
| 8/4 | 0.1531 | 0.1537 | 0.1482 |
| | 0.0636 | 0.0660 | 0.0635 |
| 16/8 | 0.1508 | 0.1541 | 0.1555 |
| | 0.0623 | 0.0609 | 0.0692 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1425 | 0.1490 | 0.1368 |
| | 0.0590 | 0.0641 | 0.0595 |
| 8/4 | 0.1446 | 0.1408 | 0.1434 |
| | 0.0585 | 0.0591 | 0.0564 |
| 16/8 | 0.1526 | 0.1499 | 0.1481 |
| | 0.0562 | 0.0560 | 0.0698 |

SEGMENT 1 VARIABLE 22 ECGPIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0290 | 0.0369 | 0.0363 |
| | 0.0495 | 0.0590 | 0.0650 |
| 8/4 | 0.0460 | 0.0440 | 0.0590 |
| | 0.0664 | 0.0643 | 0.0777 |
| 16/8 | 0.0569 | 0.0586 | 0.0626 |
| | 0.0785 | 0.0813 | 0.0774 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0516 | 0.0541 | 0.0603 |
| | 0.0741 | 0.0698 | 0.0761 |
| 8/4 | 0.0681 | 0.0618 | 0.0635 |
| | 0.0790 | 0.0739 | 0.0737 |
| 16/8 | 0.0596 | 0.0609 | 0.0678 |
| | 0.0764 | 0.0720 | 0.0777 |

SEGMENT 1 VARIABLE 23 ECGQIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1864 | 0.1853 | 0.1957 |
| | 0.0955 | 0.0965 | 0.0935 |
| 8/4 | 0.1856 | 0.1697 | 0.1858 |
| | 0.0964 | 0.0935 | 0.0959 |
| 16/8 | 0.1852 | 0.1775 | 0.1860 |
| | 0.0967 | 0.0986 | 0.0959 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1822 | 0.1857 | 0.1790 |
| | 0.0950 | 0.0958 | 0.0965 |
| 8/4 | 0.1776 | 0.1772 | 0.1753 |
| | 0.0978 | 0.0942 | 0.0952 |
| 16/8 | 0.1712 | 0.1804 | 0.1831 |
| | 0.0942 | 0.0972 | 0.0990 |

SEGMENT 1 VARIABLE 24 ECGRIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0394 | 0.0391 | 0.0389 |
| | 0.0058 | 0.0057 | 0.0056 |
| 8/4 | 0.0387 | 0.0390 | 0.0393 |
| | 0.0051 | 0.0055 | 0.0065 |
| 16/8 | 0.0389 | 0.0389 | 0.0390 |
| | 0.0056 | 0.0056 | 0.0056 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0386 | 0.0384 | 0.0382 |
| | 0.0058 | 0.0056 | 0.0053 |
| 8/4 | 0.0380 | 0.0385 | 0.0380 |
| | 0.0054 | 0.0069 | 0.0058 |
| 16/8 | 0.0379 | 0.0382 | 0.0378 |
| | 0.0058 | 0.0061 | 0.0059 |

SEGMENT 1 VARIABLE 25 ECGSIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1505 | 0.1497 | 0.1486 |
| | 0.0401 | 0.0356 | 0.0351 |
| 8/4 | 0.1449 | 0.1472 | 0.1455 |
| | 0.0263 | 0.0266 | 0.0272 |
| 16/8 | 0.1447 | 0.1450 | 0.1455 |
| | 0.0245 | 0.0256 | 0.0270 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1480 | 0.1476 | 0.1454 |
| | 0.0330 | 0.0357 | 0.0305 |
| 8/4 | 0.1440 | 0.1432 | 0.1437 |
| | 0.0265 | 0.0301 | 0.0267 |
| 16/8 | 0.1433 | 0.1427 | 0.1423 |
| | 0.0237 | 0.0235 | 0.0252 |

SEGMENT 1 VARIABLE 26 ECGIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1282 | 0.1235 | 0.1280 |
| | 0.0375 | 0.0373 | 0.0328 |
| 8/4 | 0.1316 | 0.1282 | 0.1298 |
| | 0.0275 | 0.0285 | 0.0315 |
| 16/8 | 0.1315 | 0.1279 | 0.1300 |
| | 0.0262 | 0.0277 | 0.0280 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1275 | 0.1258 | 0.1294 |
| | 0.0355 | 0.0390 | 0.0366 |
| 8/4 | 0.1273 | 0.1258 | 0.1263 |
| | 0.0334 | 0.0313 | 0.0344 |
| 16/8 | 0.1236 | 0.1237 | 0.1256 |
| | 0.0325 | 0.0338 | 0.0328 |

SEGMENT 1 VARIABLE 31 PITCH

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0971 | 0.1084 | 0.0846 |
| | 0.0479 | 0.0402 | 0.0402 |
| 8/4 | 0.0967 | 0.1001 | 0.0707 |
| | 0.0523 | 0.0412 | 0.0280 |
| 16/8 | 0.1053 | 0.1207 | 0.0808 |
| | 0.0578 | 0.0471 | 0.0294 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0841 | 0.1079 | 0.0680 |
| | 0.0458 | 0.0461 | 0.0254 |
| 8/4 | 0.0815 | 0.0948 | 0.0625 |
| | 0.0306 | 0.0356 | 0.0224 |
| 16/8 | 0.1152 | 0.1097 | 0.0682 |
| | 0.0762 | 0.0325 | 0.0275 |

SEGMENT 1 VARIABLE 52 ROLL

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1124 | 0.1404 | 0.1388 |
| | 0.0398 | 0.0536 | 0.0650 |
| 8/4 | 0.1301 | 0.1777 | 0.1521 |
| | 0.0411 | 0.0621 | 0.0659 |
| 16/8 | 0.1791 | 0.2298 | 0.1886 |
| | 0.0487 | 0.0699 | 0.0460 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1256 | 0.1636 | 0.1439 |
| | 0.0631 | 0.0784 | 0.1024 |
| 8/4 | 0.1397 | 0.1866 | 0.1819 |
| | 0.0525 | 0.0662 | 0.1316 |
| 16/8 | 0.2143 | 0.2482 | 0.2482 |
| | 0.0639 | 0.0557 | 0.1306 |

SEGMENT 1 VARIABLE 53 POWER

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3144 | 0.2868 | 0.2849 |
| | 0.1847 | 0.1369 | 0.1591 |
| 8/4 | 0.3477 | 0.3246 | 0.2946 |
| | 0.1608 | 0.1663 | 0.1545 |
| 16/8 | 0.3985 | 0.3862 | 0.3765 |
| | 0.1580 | 0.1365 | 0.1631 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2791 | 0.2748 | 0.2683 |
| | 0.1459 | 0.1382 | 0.1602 |
| 8/4 | 0.3010 | 0.3437 | 0.2989 |
| | 0.1189 | 0.1582 | 0.1542 |
| 16/8 | 0.4106 | 0.4001 | 0.3548 |
| | 0.1616 | 0.1393 | 0.1453 |

SEGMENT 1 VARIABLE 34 HEADING

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1961 | 0.2099 | 0.2602 |
| | 0.0783 | 0.0714 | 0.1269 |
| 8/4 | 0.2219 | 0.2476 | 0.2698 |
| | 0.0525 | 0.1045 | 0.0969 |
| 16/8 | 0.3140 | 0.3511 | 0.3567 |
| | 0.0744 | 0.0873 | 0.0905 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1548 | 0.1597 | 0.1717 |
| | 0.0510 | 0.0609 | 0.0862 |
| 8/4 | 0.1559 | 0.1860 | 0.1891 |
| | 0.0346 | 0.0435 | 0.0577 |
| 16/8 | 0.2702 | 0.2914 | 0.2740 |
| | 0.0620 | 0.0906 | 0.0742 |

SEGMENT 1 VARIABLE 35 ROLLAC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.3543 | 2.2389 | 3.1868 |
| | 0.6389 | 0.8528 | 1.1160 |
| 8/4 | 2.9365 | 3.2109 | 3.8809 |
| | 0.3543 | 0.5404 | 0.7918 |
| 16/8 | 4.8713 | 4.9971 | 5.6482 |
| | 0.6451 | 0.6599 | 0.8583 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.5968 | 2.9594 | 3.6139 |
| | 0.7213 | 1.5357 | 1.1486 |
| 8/4 | 3.5931 | 3.6123 | 4.6253 |
| | 0.8267 | 0.8460 | 1.3907 |
| 16/8 | 5.6047 | 5.4183 | 6.4901 |
| | 1.0879 | 1.1059 | 1.5167 |

SEGMENT 1 VARIABLE 36 PITCHAC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.8194 | 1.0704 | 0.9264 |
| | 0.3718 | 0.6582 | 0.3701 |
| 8/4 | 0.8424 | 1.0311 | 1.0552 |
| | 0.3112 | 0.4333 | 0.4055 |
| 16/8 | 0.9827 | 1.4043 | 1.2807 |
| | 0.3055 | 0.6657 | 0.5298 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.9105 | 1.4001 | 1.4665 |
| | 0.3740 | 1.0951 | 0.8150 |
| 8/4 | 1.0098 | 1.3535 | 1.5676 |
| | 0.5037 | 0.7568 | 0.9161 |
| 16/8 | 1.4320 | 1.9717 | 1.9122 |
| | 0.7255 | 0.9618 | 1.0416 |

SEGMENT 1 VARIABLE 37 YAWACC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.4759 | 1.3543 | 1.5466 |
| | 0.6071 | 0.4394 | 0.6143 |
| 8/4 | 2.4221 | 2.4928 | 2.6261 |
| | 0.5361 | 0.5588 | 0.6154 |
| 16/8 | 4.0309 | 4.2456 | 4.3228 |
| | 0.4226 | 0.5591 | 0.6727 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.3398 | 1.4753 | 1.4027 |
| | 0.4434 | 0.6307 | 0.6681 |
| 8/4 | 2.5746 | 2.4081 | 2.5592 |
| | 0.3292 | 0.2864 | 0.6590 |
| 16/8 | 4.1682 | 3.9920 | 4.2462 |
| | 0.7265 | 0.7188 | 0.8480 |

SEGMENT 1 VARIABLE 38 SPEEDER

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 5.0614 | 5.4944 | 2.4676 |
| | 1.5586 | 1.4722 | 1.2025 |
| 8/4 | 3.5735 | 3.3065 | 2.3112 |
| | 1.4503 | 1.6886 | 1.1009 |
| 16/8 | 5.1725 | 4.9123 | 4.1225 |
| | 3.7212 | 4.0791 | 2.6986 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 4.7954 | 6.5209 | 3.1389 |
| | 4.7426 | 7.6688 | 1.7160 |
| 8/4 | 5.2454 | 6.1494 | 4.6054 |
| | 4.1521 | 5.9751 | 3.3028 |
| 16/8 | 7.4151 | 10.9213 | 4.6680 |
| | 5.5049 | 8.7927 | 2.9408 |

SEGMENT 1 VARIABLE 39 S/PITCH

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.8156 | 0.8161 | 0.8155 |
| | 0.0075 | 0.0061 | 0.0053 |
| 8/4 | 0.8167 | 0.8167 | 0.8146 |
| | 0.0086 | 0.0129 | 0.0098 |
| 16/8 | 0.8179 | 0.8171 | 0.8205 |
| | 0.0167 | 0.0196 | 0.0190 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.8158 | 0.8152 | 0.8150 |
| | 0.0065 | 0.0082 | 0.0061 |
| 8/4 | 0.8152 | 0.8143 | 0.8156 |
| | 0.0112 | 0.0141 | 0.0091 |
| 16/8 | 0.8195 | 0.8096 | 0.8134 |
| | 0.0220 | 0.0218 | 0.0142 |

SEGMENT 1 VARIABLE 40 S/ROLL

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.1356 | 1.1355 | 1.1362 |
| | 0.0065 | 0.0056 | 0.0056 |
| 8/4 | 1.1305 | 1.1321 | 1.1352 |
| | 0.0069 | 0.0083 | 0.0058 |
| 16/8 | 1.1248 | 1.1294 | 1.1254 |
| | 0.0133 | 0.0130 | 0.0125 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.1302 | 1.1293 | 1.1334 |
| | 0.0102 | 0.0113 | 0.0065 |
| 8/4 | 1.1273 | 1.1280 | 1.1286 |
| | 0.0094 | 0.0113 | 0.0081 |
| 16/8 | 1.1198 | 1.1200 | 1.1288 |
| | 0.0167 | 0.0191 | 0.0106 |

SEGMENT 1 VARIABLE 41 S/YAW

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7427 | 0.7413 | 0.7416 |
| | 0.0062 | 0.0082 | 0.0094 |
| 8/4 | 0.7367 | 0.7383 | 0.7400 |
| | 0.0092 | 0.0126 | 0.0087 |
| 16/8 | 0.7360 | 0.7364 | 0.7318 |
| | 0.0155 | 0.0178 | 0.0143 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7338 | 0.7329 | 0.7372 |
| | 0.0123 | 0.0178 | 0.0080 |
| 8/4 | 0.7340 | 0.7355 | 0.7338 |
| | 0.0097 | 0.0135 | 0.0098 |
| 16/8 | 0.7272 | 0.7219 | 0.7337 |
| | 0.0163 | 0.0229 | 0.0134 |

SEGMENT 1 VARIABLE 42 PORSET

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2644 | 0.2657 | 0.2626 |
| | 0.0152 | 0.0186 | 0.0120 |
| 8/4 | 0.2726 | 0.2712 | 0.2646 |
| | 0.0199 | 0.0234 | 0.0151 |
| 16/8 | 0.2905 | 0.2837 | 0.2941 |
| | 0.0359 | 0.0420 | 0.0320 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2792 | 0.2822 | 0.2703 |
| | 0.0256 | 0.0337 | 0.0178 |
| 8/4 | 0.2854 | 0.2871 | 0.2831 |
| | 0.0257 | 0.0346 | 0.0223 |
| 16/8 | 0.3076 | 0.3095 | 0.2896 |
| | 0.0504 | 0.0493 | 0.0315 |

SEGMENT 1 VARIABLE 43 ALTERR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 20.6046 | 16.8588 | 18.2060 |
| | 20.8455 | 13.8738 | 12.9317 |
| 8/4 | 23.0468 | 21.5614 | 18.9362 |
| | 18.6486 | 17.8137 | 15.1447 |
| 16/8 | 26.6195 | 23.1584 | 25.0580 |
| | 19.6599 | 12.8743 | 20.0486 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 21.3646 | 18.1976 | 18.5543 |
| | 14.8758 | 14.8824 | 20.3824 |
| 8/4 | 17.7805 | 21.5579 | 21.2090 |
| | 10.0394 | 13.6824 | 14.8891 |
| 16/8 | 30.6383 | 26.2399 | 20.2810 |
| | 31.6201 | 17.7858 | 15.1285 |

SEGMENT 1 VARIABLE 44 CXERR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 67.5063 | 30.8851 | 66.8368 |
| | 184.7544 | 12.7148 | 86.5018 |
| 8/4 | 33.1181 | 45.8362 | 45.2785 |
| | 10.0469 | 56.5508 | 33.2743 |
| 16/8 | 40.6177 | 82.2296 | 56.9928 |
| | 16.6061 | 158.4361 | 43.9131 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 42.7055 | 41.7750 | 68.4904 |
| | 44.0153 | 27.0155 | 88.5721 |
| 8/4 | 39.6449 | 40.7392 | 56.8363 |
| | 54.4996 | 27.2517 | 89.2965 |
| 16/8 | 58.6558 | 82.5194 | 66.4687 |
| | 63.2987 | 56.6177 | 76.6702 |

SEGMENT 1 VARIABLE 45 SACCLM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5921 | 1.5488 | 1.6903 |
| | 0.5218 | 0.6769 | 0.7100 |
| 8/4 | 1.5663 | 1.2323 | 1.6733 |
| | 0.4014 | 0.5904 | 0.5861 |
| 16/8 | 1.6893 | 1.2340 | 1.7484 |
| | 0.7916 | 0.8569 | 0.8311 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5846 | 1.5650 | 1.7604 |
| | 0.5674 | 0.7191 | 0.7503 |
| 8/4 | 1.6670 | 1.5142 | 1.7806 |
| | 0.5944 | 0.7275 | 0.6365 |
| 16/8 | 1.7944 | 1.5011 | 2.0040 |
| | 0.6513 | 0.4685 | 0.9550 |

SEGMENT 1 VARIABLE 46 SACCLS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.4492 | 1.5767 | 1.4313 |
| | 0.6707 | 0.9334 | 0.6659 |
| 8/4 | 1.4940 | 1.3259 | 1.5359 |
| | 0.6300 | 0.8695 | 0.7995 |
| 16/8 | 1.5917 | 1.2991 | 1.5140 |
| | 0.6417 | 0.9954 | 0.7520 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5586 | 1.4873 | 1.6519 |
| | 0.6456 | 0.8625 | 0.7504 |
| 8/4 | 1.6333 | 1.5946 | 1.6785 |
| | 0.6077 | 0.9032 | 0.7529 |
| 16/8 | 1.7411 | 1.5922 | 1.7971 |
| | 0.6682 | 0.6008 | 0.8975 |

SEGMENT 1 VARIABLE 47 DWELLM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5252 | 1.0781 | 0.5651 |
| | 0.1673 | 0.9187 | 0.4685 |
| 8/4 | 0.5081 | 1.0890 | 0.5047 |
| | 0.1404 | 0.7810 | 0.1281 |
| 16/8 | 0.5458 | 1.2412 | 0.5341 |
| | 0.2301 | 1.0623 | 0.2486 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3990 | 0.5824 | 0.3830 |
| | 0.1513 | 0.3588 | 0.2512 |
| 8/4 | 0.3405 | 0.4380 | 0.2949 |
| | 0.1422 | 0.2299 | 0.0744 |
| 16/8 | 0.2869 | 0.3058 | 0.2799 |
| | 0.0663 | 0.1078 | 0.0672 |

SEGMENT 1 VARIABLE 48 DWELLS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5065 | 1.0571 | 0.5948 |
| | 0.2450 | 1.0060 | 0.8085 |
| 8/4 | 0.4755 | 1.0712 | 0.5048 |
| | 0.2065 | 0.7707 | 0.1913 |
| 16/8 | 0.5489 | 1.1771 | 0.5169 |
| | 0.3441 | 1.0048 | 0.2669 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3559 | 0.5770 | 0.3447 |
| | 0.1619 | 0.5552 | 0.3051 |
| 8/4 | 0.2701 | 0.3844 | 0.2235 |
| | 0.1801 | 0.2795 | 0.0714 |
| 16/8 | 0.2177 | 0.2319 | 0.2069 |
| | 0.0875 | 0.1215 | 0.0721 |

SEGMENT 1 VARIABLE 49 FIXRATE

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.0685 | 1.3851 | 2.1130 |
| | 0.5775 | 0.6845 | 0.5892 |
| 8/4 | 2.1262 | 1.2952 | 2.0888 |
| | 0.5517 | 0.6006 | 0.5292 |
| 16/8 | 2.0896 | 1.3305 | 2.0953 |
| | 0.6568 | 0.7578 | 0.6687 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.8756 | 2.3554 | 2.9919 |
| | 0.7561 | 0.9113 | 0.7922 |
| 8/4 | 3.2618 | 2.8066 | 3.3462 |
| | 0.7521 | 0.9268 | 0.4973 |
| 16/8 | 3.4109 | 3.3547 | 3.4042 |
| | 0.3952 | 0.5317 | 0.4783 |

SEGMENT 1 VARIABLE 50 BLINKR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1553 | 0.1579 | 0.1100 |
| | 0.0957 | 0.1094 | 0.0911 |
| 8/4 | 0.1602 | 0.1484 | 0.1176 |
| | 0.1149 | 0.1358 | 0.0893 |
| 16/8 | 0.1725 | 0.1550 | 0.1281 |
| | 0.2000 | 0.1254 | 0.0987 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2781 | 0.4677 | 0.3137 |
| | 0.2640 | 0.8512 | 0.3994 |
| 8/4 | 0.4799 | 0.5400 | 0.3673 |
| | 0.6399 | 0.6456 | 0.3471 |
| 16/8 | 0.6672 | 0.6838 | 0.6095 |
| | 0.3220 | 0.9096 | 0.3637 |

SEGMENT 1 VARIABLE 51 PUPILD

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 5.5603 | 5.9369 | 5.4355 |
| | 1.3127 | 1.4127 | 1.4042 |
| 8/4 | 5.5729 | 5.8401 | 5.4709 |
| | 1.1418 | 1.1443 | 1.2732 |
| 16/8 | 5.7326 | 5.9050 | 5.5855 |
| | 1.2002 | 1.1839 | 1.2632 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 5.3522 | 5.4279 | 5.3103 |
| | 1.3406 | 1.3528 | 1.3653 |
| 8/4 | 5.2887 | 5.2844 | 5.2075 |
| | 1.2707 | 1.2502 | 1.3259 |
| 16/8 | 5.3971 | 5.3402 | 5.3272 |
| | 1.1878 | 1.1500 | 1.3427 |

SEGMENT 2 VARIABLE 1 EMGARM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 15.7849 | 16.9211 | 16.8578 |
| | 7.1558 | 7.7315 | 7.1663 |
| 8/4 | 16.4281 | 17.2103 | 17.2959 |
| | 6.6223 | 7.0188 | 7.4229 |
| 16/8 | 16.9009 | 17.5168 | 17.1387 |
| | 7.0776 | 6.9071 | 6.8142 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 17.8192 | 19.6804 | 19.2847 |
| | 7.7534 | 9.0900 | 7.1149 |
| 8/4 | 18.9181 | 21.1861 | 18.6513 |
| | 8.7766 | 9.4104 | 5.9981 |
| 16/8 | 20.2775 | 22.0499 | 22.2690 |
| | 8.8773 | 9.8587 | 9.1463 |

SEGMENT 2 VARIABLE 2 EMGARS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 10.6156 | 11.4781 | 11.2086 |
| | 5.1457 | 5.4625 | 4.8714 |
| 8/4 | 11.4494 | 11.5684 | 11.8531 |
| | 5.0521 | 4.8398 | 5.6329 |
| 16/8 | 11.5042 | 11.8596 | 11.6497 |
| | 5.0935 | 4.7990 | 5.0476 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 12.1082 | 13.4177 | 12.9457 |
| | 5.6835 | 6.3847 | 5.1177 |
| 8/4 | 12.7797 | 14.3468 | 12.8125 |
| | 6.5786 | 6.5142 | 4.4367 |
| 16/8 | 13.8655 | 14.9990 | 15.2927 |
| | 5.1148 | 7.1469 | 6.6348 |

SEGMENT 2 VARIABLE 4 EMGALR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 13.6039 | 14.9247 | 12.7932 |
| | 5.5324 | 6.3156 | 4.7391 |
| 8/4 | 14.1137 | 14.6789 | 13.2323 |
| | 6.5353 | 6.7582 | 5.1576 |
| 16/8 | 14.1625 | 15.3712 | 13.6667 |
| | 5.9308 | 7.6308 | 5.7229 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 15.7450 | 15.4806 | 14.5746 |
| | 7.3868 | 6.5125 | 6.8184 |
| 8/4 | 16.5026 | 16.9997 | 15.2046 |
| | 8.5683 | 8.6832 | 8.1123 |
| 16/8 | 16.4047 | 17.2097 | 15.8489 |
| | 8.1861 | 8.7816 | 9.0272 |

SEGMENT 2 VARIABLE 5 EMGALS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 11.0203 | 11.5283 | 10.3260 |
| | 5.1042 | 5.2549 | 4.2984 |
| 8/4 | 10.5693 | 11.1204 | 10.9591 |
| | 4.9693 | 5.3320 | 4.5867 |
| 16/8 | 10.9351 | 11.5421 | 10.4316 |
| | 4.6876 | 5.8158 | 4.5293 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 12.3385 | 11.9212 | 11.3296 |
| | 6.4916 | 5.5798 | 5.5775 |
| 8/4 | 12.7800 | 13.0054 | 11.6464 |
| | 6.5397 | 6.8818 | 6.2721 |
| 16/8 | 12.4042 | 12.7894 | 12.0439 |
| | 6.1703 | 7.0520 | 6.5332 |

SEGMENT 2 VARIABLE 7 RESAMP

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 138.9894 | 139.7635 | 140.7130 |
| | 58.8759 | 54.1126 | 57.9160 |
| 8/4 | 135.0946 | 136.5592 | 135.2716 |
| | 48.5829 | 47.3096 | 46.7688 |
| 16/8 | 139.8074 | 140.7952 | 139.2892 |
| | 49.7955 | 48.3857 | 53.3662 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 140.4742 | 140.7389 | 149.1615 |
| | 57.5635 | 52.2468 | 54.7727 |
| 8/4 | 141.6179 | 136.7025 | 146.4150 |
| | 45.2196 | 45.3100 | 49.6536 |
| 16/8 | 141.3220 | 145.4686 | 150.1790 |
| | 42.2651 | 42.2429 | 48.3910 |

SEGMENT 2 VARIABLE 8 RESAMS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 23.9816 | 19.4498 | 22.4647 |
| | 16.1754 | 7.8246 | 9.6692 |
| 8/4 | 22.2764 | 22.1290 | 22.1029 |
| | 9.5223 | 8.5865 | 11.3169 |
| 16/8 | 26.2575 | 24.4852 | 27.0535 |
| | 14.4695 | 13.0529 | 17.2493 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 24.4718 | 22.0115 | 24.6162 |
| | 13.7873 | 9.2456 | 14.4830 |
| 8/4 | 30.6303 | 27.5253 | 27.3897 |
| | 25.3393 | 13.9256 | 21.3073 |
| 16/8 | 25.8499 | 27.0703 | 29.6565 |
| | 10.9660 | 12.7960 | 20.0376 |

SEGMENT 2 VARIABLE 9 RESPDM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.6101 | 2.5865 | 2.6025 |
| | 0.3070 | 0.3583 | 0.2459 |
| 8/4 | 2.5948 | 2.5050 | 2.5424 |
| | 0.3267 | 0.2718 | 0.2922 |
| 16/8 | 2.4997 | 2.4949 | 2.5194 |
| | 0.2857 | 0.2933 | 0.2645 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.4594 | 2.4113 | 2.4556 |
| | 0.2842 | 0.2692 | 0.3073 |
| 8/4 | 2.5372 | 2.4086 | 2.4043 |
| | 0.5447 | 0.5439 | 0.5111 |
| 16/8 | 2.3405 | 2.3625 | 2.3985 |
| | 0.4276 | 0.3722 | 0.5138 |

SEGMENT 2 VARIABLE 10 RESPDS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2729 | 0.2208 | 0.2223 |
| | 0.1741 | 0.1489 | 0.1331 |
| 8/4 | 0.2449 | 0.2441 | 0.2408 |
| | 0.1477 | 0.1809 | 0.1494 |
| 16/8 | 0.2241 | 0.2591 | 0.2609 |
| | 0.1249 | 0.1156 | 0.1496 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2538 | 0.2470 | 0.2382 |
| | 0.1404 | 0.1687 | 0.1145 |
| 8/4 | 0.3544 | 0.3012 | 0.2689 |
| | 0.4762 | 0.2247 | 0.1936 |
| 16/8 | 0.3204 | 0.3171 | 0.3178 |
| | 0.5862 | 0.4006 | 0.4402 |

SEGMENT 2 VARIABLE 13 ECGRAM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 244.9880 | 244.6176 | 244.9096 |
| | 96.7330 | 96.6030 | 96.3109 |
| 8/4 | 242.2010 | 243.6901 | 243.5673 |
| | 93.5526 | 94.1481 | 94.9148 |
| 16/8 | 243.7491 | 245.2549 | 239.2424 |
| | 94.0724 | 95.0506 | 91.4700 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 247.3397 | 249.9620 | 250.4233 |
| | 94.6051 | 96.0302 | 95.9581 |
| 8/4 | 247.0127 | 245.8797 | 246.5853 |
| | 95.5012 | 92.9531 | 94.9755 |
| 16/8 | 243.5441 | 243.9742 | 242.3014 |
| | 92.9078 | 92.3858 | 91.1287 |

SEGMENT 2 VARIABLE 14 ECGRAS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 17.1219 | 17.7249 | 18.1633 |
| | 21.2487 | 19.5409 | 18.6070 |
| 8/4 | 22.3912 | 21.1142 | 20.5540 |
| | 22.9749 | 22.5081 | 21.5201 |
| 16/8 | 22.4725 | 15.9828 | 23.5500 |
| | 23.5859 | 17.9037 | 25.7499 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 21.9738 | 20.8576 | 17.9023 |
| | 25.7972 | 20.4055 | 24.8189 |
| 8/4 | 19.9767 | 25.4760 | 23.4700 |
| | 22.0464 | 26.2887 | 25.2937 |
| 16/8 | 19.5507 | 21.8866 | 26.5555 |
| | 20.5934 | 23.3402 | 28.9471 |

SEGMENT 2 VARIABLE 15 ECGRDM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7092 | 0.7000 | 0.7334 |
| | 0.0976 | 0.0775 | 0.0758 |
| 8/4 | 0.6984 | 0.6910 | 0.6968 |
| | 0.0815 | 0.0695 | 0.0961 |
| 16/8 | 0.7023 | 0.6939 | 0.6964 |
| | 0.0775 | 0.0798 | 0.0848 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7079 | 0.6960 | 0.6949 |
| | 0.0973 | 0.0920 | 0.0929 |
| 8/4 | 0.6916 | 0.6936 | 0.6941 |
| | 0.0904 | 0.0900 | 0.0931 |
| 16/8 | 0.6794 | 0.6862 | 0.6727 |
| | 0.0891 | 0.0801 | 0.0853 |

SEGMENT 2 VARIABLE 16 ECGRDS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0794 | 0.0856 | 0.0962 |
| | 0.0446 | 0.0500 | 0.0593 |
| 8/4 | 0.0906 | 0.0912 | 0.0824 |
| | 0.0433 | 0.0529 | 0.0425 |
| 16/8 | 0.0920 | 0.0873 | 0.0896 |
| | 0.0552 | 0.0386 | 0.0544 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0828 | 0.0852 | 0.0816 |
| | 0.0496 | 0.0472 | 0.0573 |
| 8/4 | 0.0900 | 0.1045 | 0.1070 |
| | 0.0521 | 0.0612 | 0.0681 |
| 16/8 | 0.0917 | 0.0972 | 0.1019 |
| | 0.0554 | 0.0682 | 0.0638 |

SEGMENT 2 VARIABLE 17 ECGP/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0111 | 0.0068 | 0.0079 |
| | 0.0284 | 0.0276 | 0.0300 |
| 8/4 | 0.0103 | 0.0149 | 0.0106 |
| | 0.0323 | 0.0278 | 0.0312 |
| 16/8 | 0.0129 | 0.0080 | 0.0144 |
| | 0.0301 | 0.0291 | 0.0288 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0152 | 0.0151 | 0.0155 |
| | 0.0360 | 0.0336 | 0.0344 |
| 8/4 | 0.0148 | 0.0193 | 0.0131 |
| | 0.0337 | 0.0317 | 0.0296 |
| 16/8 | 0.0163 | 0.0171 | 0.0123 |
| | 0.0350 | 0.0291 | 0.0336 |

SEGMENT 2 VARIABLE 18 ECGQ/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1456 | -0.1464 | -0.1469 |
| | 0.0703 | 0.0711 | 0.0696 |
| 8/4 | -0.1470 | -0.1432 | -0.1468 |
| | 0.0667 | 0.0688 | 0.0647 |
| 16/8 | -0.1443 | -0.1521 | -0.1455 |
| | 0.0664 | 0.0703 | 0.0645 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1446 | -0.1533 | -0.1493 |
| | 0.0609 | 0.0667 | 0.0647 |
| 8/4 | -0.1477 | -0.1468 | -0.1532 |
| | 0.0623 | 0.0624 | 0.0662 |
| 16/8 | -0.1577 | -0.1523 | -0.1563 |
| | 0.0687 | 0.0650 | 0.0719 |

SEGMENT 2 VARIABLE 20 ECGS/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1686 | -0.1733 | -0.1726 |
| | 0.0645 | 0.0653 | 0.0606 |
| 8/4 | -0.1724 | -0.1757 | -0.1744 |
| | 0.0647 | 0.0625 | 0.0604 |
| 16/8 | -0.1709 | -0.1755 | -0.1714 |
| | 0.0585 | 0.0603 | 0.0604 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1773 | -0.1825 | -0.1749 |
| | 0.0618 | 0.0635 | 0.0644 |
| 8/4 | -0.1778 | -0.1762 | -0.1794 |
| | 0.0621 | 0.0635 | 0.0630 |
| 16/8 | -0.1869 | -0.1864 | -0.1835 |
| | 0.0685 | 0.0688 | 0.0666 |

SEGMENT 2 VARIABLE 21 ECGT/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1459 | 0.1479 | 0.1535 |
| | 0.0640 | 0.0706 | 0.0695 |
| 8/4 | 0.1533 | 0.1518 | 0.1510 |
| | 0.0680 | 0.0586 | 0.0622 |
| 16/8 | 0.1507 | 0.1593 | 0.1557 |
| | 0.0571 | 0.0673 | 0.0663 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1423 | 0.1482 | 0.1420 |
| | 0.0601 | 0.0605 | 0.0593 |
| 8/4 | 0.1472 | 0.1440 | 0.1486 |
| | 0.0643 | 0.0647 | 0.0563 |
| 16/8 | 0.1465 | 0.1533 | 0.1483 |
| | 0.0686 | 0.0606 | 0.0647 |

SEGMENT 2 VARIABLE 22 ECGPIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0387 | 0.0474 | 0.0485 |
| | 0.0589 | 0.0715 | 0.0673 |
| 8/4 | 0.0554 | 0.0515 | 0.0588 |
| | 0.0732 | 0.0705 | 0.0735 |
| 16/8 | 0.0535 | 0.0588 | 0.0656 |
| | 0.0738 | 0.0763 | 0.0763 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0605 | 0.0495 | 0.0600 |
| | 0.0791 | 0.0640 | 0.0728 |
| 8/4 | 0.0619 | 0.0702 | 0.0631 |
| | 0.0754 | 0.0826 | 0.0695 |
| 16/8 | 0.0698 | 0.0658 | 0.0562 |
| | 0.0740 | 0.0736 | 0.0718 |

SEGMENT 2 VARIABLE 23 ECGQIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1793 | 0.1854 | 0.1811 |
| | 0.0920 | 0.0961 | 0.0945 |
| 8/4 | 0.1853 | 0.1698 | 0.1827 |
| | 0.0965 | 0.0959 | 0.0946 |
| 16/8 | 0.1803 | 0.1918 | 0.1793 |
| | 0.0921 | 0.0962 | 0.0932 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1860 | 0.1840 | 0.1813 |
| | 0.0930 | 0.0938 | 0.0955 |
| 8/4 | 0.1842 | 0.1759 | 0.1811 |
| | 0.0978 | 0.0919 | 0.0965 |
| 16/8 | 0.1801 | 0.1795 | 0.1834 |
| | 0.0972 | 0.0911 | 0.0959 |

SEGMENT 2 VARIABLE 24 ECGRIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0399 | 0.0393 | 0.0392 |
| | 0.0068 | 0.0061 | 0.0055 |
| 8/4 | 0.0391 | 0.0392 | 0.0391 |
| | 0.0056 | 0.0058 | 0.0055 |
| 16/8 | 0.0392 | 0.0389 | 0.0392 |
| | 0.0060 | 0.0057 | 0.0060 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0386 | 0.0384 | 0.0387 |
| | 0.0054 | 0.0053 | 0.0056 |
| 8/4 | 0.0381 | 0.0384 | 0.0379 |
| | 0.0054 | 0.0060 | 0.0055 |
| 16/8 | 0.0382 | 0.0382 | 0.0382 |
| | 0.0064 | 0.0062 | 0.0061 |

SEGMENT 2 VARIABLE 25 ECGSIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1464 | 0.1475 | 0.1470 |
| | 0.0315 | 0.0300 | 0.0279 |
| 8/4 | 0.1455 | 0.1453 | 0.1443 |
| | 0.0248 | 0.0245 | 0.0267 |
| 16/8 | 0.1446 | 0.1442 | 0.1455 |
| | 0.0260 | 0.0248 | 0.0266 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1439 | 0.1448 | 0.1422 |
| | 0.0289 | 0.0284 | 0.0285 |
| 8/4 | 0.1432 | 0.1432 | 0.1419 |
| | 0.0252 | 0.0274 | 0.0237 |
| 16/8 | 0.1415 | 0.1411 | 0.1396 |
| | 0.0263 | 0.0237 | 0.0265 |

SEGMENT 2 VARIABLE 26 ECGTIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1291 | 0.1244 | 0.1273 |
| | 0.0301 | 0.0269 | 0.0309 |
| 8/4 | 0.1288 | 0.1280 | 0.1292 |
| | 0.0278 | 0.0288 | 0.0291 |
| 16/8 | 0.1298 | 0.1269 | 0.1292 |
| | 0.0303 | 0.0259 | 0.0310 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1263 | 0.1254 | 0.1262 |
| | 0.0408 | 0.0358 | 0.0330 |
| 8/4 | 0.1260 | 0.1243 | 0.1224 |
| | 0.0329 | 0.0334 | 0.0316 |
| 16/8 | 0.1246 | 0.1219 | 0.1253 |
| | 0.0348 | 0.0337 | 0.0334 |

SEGMENT 2 VARIABLE 31 PITCH

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0848 | 0.1214 | 0.0864 |
| | 0.0379 | 0.0502 | 0.0489 |
| 8/4 | 0.1027 | 0.1410 | 0.0880 |
| | 0.0510 | 0.0520 | 0.0398 |
| 16/8 | 0.1457 | 0.1500 | 0.1050 |
| | 0.0620 | 0.0558 | 0.0401 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1027 | 0.1233 | 0.0836 |
| | 0.0579 | 0.0514 | 0.0357 |
| 8/4 | 0.1099 | 0.1271 | 0.0921 |
| | 0.0504 | 0.0521 | 0.0362 |
| 16/8 | 0.1676 | 0.1438 | 0.0993 |
| | 0.1165 | 0.0513 | 0.0383 |

SEGMENT 2 VARIABLE 32 ROLL

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0953 | 0.1211 | 0.1347 |
| | 0.0309 | 0.0505 | 0.0801 |
| 8/4 | 0.1376 | 0.1660 | 0.1503 |
| | 0.0508 | 0.0676 | 0.0536 |
| 16/8 | 0.1580 | 0.1946 | 0.1932 |
| | 0.0585 | 0.0665 | 0.1128 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1077 | 0.1212 | 0.1271 |
| | 0.0584 | 0.0451 | 0.0883 |
| 8/4 | 0.1575 | 0.1784 | 0.1882 |
| | 0.0810 | 0.0586 | 0.1305 |
| 16/8 | 0.2182 | 0.2276 | 0.2303 |
| | 0.0884 | 0.0865 | 0.1035 |

SEGMENT 2 VARIABLE 33 POWER

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1833 | 0.2219 | 0.1911 |
| | 0.0613 | 0.0961 | 0.0860 |
| 8/4 | 0.2173 | 0.2659 | 0.2104 |
| | 0.0885 | 0.1228 | 0.0780 |
| 16/8 | 0.3022 | 0.3698 | 0.3157 |
| | 0.1125 | 0.1655 | 0.2096 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1886 | 0.2128 | 0.1677 |
| | 0.0747 | 0.0948 | 0.1010 |
| 8/4 | 0.2236 | 0.2850 | 0.1996 |
| | 0.0725 | 0.1658 | 0.0785 |
| 16/8 | 0.3405 | 0.3579 | 0.3228 |
| | 0.1621 | 0.1633 | 0.1504 |

SEGMENT 2 VARIABLE 34 HEADING

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1780 | 0.2091 | 0.3155 |
| | 0.0720 | 0.0873 | 0.1510 |
| 8/4 | 0.2517 | 0.3078 | 0.3458 |
| | 0.0879 | 0.1236 | 0.1170 |
| 16/8 | 0.4479 | 0.4640 | 0.4865 |
| | 0.1007 | 0.1097 | 0.0960 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1518 | 0.1590 | 0.2747 |
| | 0.0765 | 0.0587 | 0.1008 |
| 8/4 | 0.2141 | 0.2500 | 0.3133 |
| | 0.0832 | 0.0777 | 0.0895 |
| 16/8 | 0.4101 | 0.4491 | 0.4628 |
| | 0.1143 | 0.1352 | 0.1235 |

SEGMENT 2 VARIABLE 35 ROLLAC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.5471 | 2.8212 | 3.8018 |
| | 0.8835 | 1.1427 | 1.3456 |
| 8/4 | 3.4027 | 3.8279 | 4.0854 |
| | 1.1973 | 1.7857 | 0.9339 |
| 16/8 | 4.7246 | 4.9439 | 5.6547 |
| | 1.1568 | 1.0466 | 1.1500 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 3.2122 | 3.5907 | 4.3950 |
| | 1.4166 | 1.8834 | 1.7243 |
| 8/4 | 3.8439 | 4.0140 | 5.0830 |
| | 1.1227 | 1.5920 | 1.6975 |
| 16/8 | 5.7663 | 5.4712 | 6.8142 |
| | 1.7600 | 1.5221 | 2.0619 |

SEGMENT 2 VARIABLE 36 PITCHAC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.1121 | 1.2962 | 1.3183 |
| | 0.3615 | 0.5093 | 0.5095 |
| 8/4 | 1.1324 | 1.9312 | 1.4606 |
| | 0.4631 | 1.7247 | 0.6726 |
| 16/8 | 1.3760 | 1.8900 | 1.8613 |
| | 0.5513 | 1.2886 | 0.7712 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5666 | 1.8674 | 2.0545 |
| | 1.2454 | 1.3630 | 1.1525 |
| 8/4 | 1.6536 | 2.1172 | 2.1686 |
| | 1.1551 | 1.4815 | 1.0158 |
| 16/8 | 2.1245 | 2.4831 | 2.8941 |
| | 1.2314 | 1.6263 | 1.8236 |

SEGMENT 2 VARIABLE 37 YAWACC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.6627 | 2.8448 | 3.7617 |
| | 1.2188 | 1.7396 | 3.9739 |
| 8/4 | 3.6492 | 4.3645 | 3.5088 |
| | 1.9782 | 2.7224 | 1.8985 |
| 16/8 | 5.0998 | 4.8065 | 5.0276 |
| | 2.1373 | 2.1683 | 2.2779 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.2572 | 2.0376 | 2.4507 |
| | 1.1860 | 0.6970 | 1.4468 |
| 8/4 | 2.6740 | 2.8872 | 3.4285 |
| | 0.6502 | 1.0247 | 1.8959 |
| 16/8 | 4.3418 | 4.3937 | 4.2128 |
| | 1.0197 | 1.9116 | 0.9647 |

SEGMENT 2 VARIABLE 38 SPEEDER

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.4483 | 3.6697 | 3.2357 |
| | 1.2600 | 1.5221 | 3.2355 |
| 8/4 | 3.2497 | 4.3396 | 2.7101 |
| | 3.5701 | 2.9410 | 1.8901 |
| 16/8 | 4.2314 | 5.8751 | 3.1432 |
| | 2.6418 | 4.0196 | 1.2775 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 3.4650 | 4.6292 | 3.0553 |
| | 2.9643 | 2.6366 | 3.5881 |
| 8/4 | 3.8806 | 4.3135 | 3.4065 |
| | 3.3191 | 2.7697 | 2.4040 |
| 16/8 | 7.0009 | 6.7208 | 4.5376 |
| | 7.0643 | 5.2801 | 4.1029 |

SEGMENT 2 VARIABLE 39 S/PITCH

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7447 | 0.7464 | 0.7474 |
| | 0.0057 | 0.0056 | 0.0062 |
| 8/4 | 0.7459 | 0.7446 | 0.7449 |
| | 0.0070 | 0.0081 | 0.0108 |
| 16/8 | 0.7524 | 0.7523 | 0.7529 |
| | 0.0095 | 0.0138 | 0.0102 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7449 | 0.7480 | 0.7460 |
| | 0.0070 | 0.0083 | 0.0071 |
| 8/4 | 0.7470 | 0.7463 | 0.7490 |
| | 0.0084 | 0.0089 | 0.0093 |
| 16/8 | 0.7587 | 0.7542 | 0.7557 |
| | 0.0258 | 0.0129 | 0.0159 |

SEGMENT 2 VARIABLE 40 S/ROLL

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.1405 | 1.1390 | 1.1364 |
| | 0.0071 | 0.0067 | 0.0127 |
| 8/4 | 1.1329 | 1.1340 | 1.1266 |
| | 0.0075 | 0.0129 | 0.0184 |
| 16/8 | 1.1181 | 1.1261 | 1.1258 |
| | 0.0211 | 0.0180 | 0.0142 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.1328 | 1.1391 | 1.1312 |
| | 0.0139 | 0.0129 | 0.0162 |
| 8/4 | 1.1260 | 1.1284 | 1.1275 |
| | 0.0195 | 0.0156 | 0.0138 |
| 16/8 | 1.1177 | 1.1143 | 1.1180 |
| | 0.0278 | 0.0343 | 0.0313 |

SEGMENT 2 VARIABLE 41 S/YAW

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7315 | 0.7299 | 0.7215 |
| | 0.0099 | 0.0096 | 0.0346 |
| 8/4 | 0.7352 | 0.7318 | 0.7273 |
| | 0.0136 | 0.0123 | 0.0247 |
| 16/8 | 0.7279 | 0.7293 | 0.7294 |
| | 0.0261 | 0.0235 | 0.0158 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7157 | 0.7244 | 0.7160 |
| | 0.0262 | 0.0183 | 0.0315 |
| 8/4 | 0.7236 | 0.7233 | 0.7226 |
| | 0.0233 | 0.0190 | 0.0155 |
| 16/8 | 0.7208 | 0.7150 | 0.7204 |
| | 0.0272 | 0.0353 | 0.0293 |

SEGMENT 2 VARIABLE 42 POWSET

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3240 | 0.3269 | 0.3412 |
| | 0.0166 | 0.0246 | 0.0477 |
| 8/4 | 0.3262 | 0.3286 | 0.3456 |
| | 0.0279 | 0.0326 | 0.0397 |
| 16/8 | 0.3432 | 0.3288 | 0.3315 |
| | 0.0447 | 0.0432 | 0.0369 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3472 | 0.3248 | 0.3536 |
| | 0.0425 | 0.0407 | 0.0451 |
| 8/4 | 0.3414 | 0.3348 | 0.3451 |
| | 0.0433 | 0.0407 | 0.0352 |
| 16/8 | 0.3431 | 0.3499 | 0.3465 |
| | 0.0659 | 0.0628 | 0.0554 |

SEGMENT 2 VARIABLE 43 ALTERR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 13.0733 | 14.2832 | 11.7291 |
| | 7.4685 | 7.0827 | 7.2820 |
| 8/4 | 13.4541 | 18.5397 | 13.1227 |
| | 6.5006 | 15.0099 | 7.2664 |
| 16/8 | 18.7441 | 27.2251 | 30.7020 |
| | 11.0267 | 21.5334 | 39.1886 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 13.2300 | 14.7769 | 12.0162 |
| | 8.1016 | 8.3138 | 12.3751 |
| 8/4 | 16.1279 | 23.0122 | 13.0573 |
| | 8.5886 | 25.3297 | 7.8415 |
| 16/8 | 35.7752 | 28.6181 | 22.0450 |
| | 50.0071 | 35.0708 | 15.6173 |

SEGMENT 2 VARIABLE 44 CXERR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 14.3221 | 20.9630 | 75.0182 |
| | 7.2121 | 10.1177 | 288.8928 |
| 8/4 | 24.8614 | 39.2991 | 27.0529 |
| | 11.7451 | 52.7739 | 16.7128 |
| 16/8 | 36.2432 | 56.5920 | 45.4001 |
| | 22.7530 | 56.3472 | 55.1106 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 17.7647 | 20.1812 | 21.4021 |
| | 13.2655 | 9.6858 | 21.7808 |
| 8/4 | 34.2733 | 30.1847 | 103.5706 |
| | 52.3599 | 11.2203 | 403.6746 |
| 16/8 | 56.7687 | 73.3961 | 166.4762 |
| | 89.2564 | 112.8522 | 408.4861 |

SEGMENT 2 VARIABLE 45 SACCLM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5545 | 1.2864 | 1.6993 |
| | 0.4475 | 0.6555 | 0.7728 |
| 8/4 | 1.5249 | 1.2338 | 1.6166 |
| | 0.4543 | 0.5474 | 0.5457 |
| 16/8 | 1.6191 | 1.2749 | 1.6737 |
| | 0.8199 | 0.9257 | 0.7816 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5596 | 1.4062 | 1.7044 |
| | 0.6136 | 0.7359 | 0.6973 |
| 8/4 | 1.6429 | 1.4351 | 1.6451 |
| | 0.6205 | 0.7207 | 0.5210 |
| 16/8 | 1.6790 | 1.5270 | 1.7587 |
| | 0.5393 | 0.5448 | 0.5269 |

SEGMENT 2 VARIABLE 46 SACCLS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5267 | 1.5943 | 1.5174 |
| | 0.7636 | 1.0628 | 0.6596 |
| 8/4 | 1.4651 | 1.5792 | 1.5291 |
| | 0.7475 | 0.8805 | 0.7234 |
| 16/8 | 1.4987 | 1.3838 | 1.4085 |
| | 0.7046 | 1.0592 | 0.7898 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.5693 | 1.5748 | 1.5882 |
| | 0.8584 | 0.7845 | 0.6742 |
| 8/4 | 1.5822 | 1.5654 | 1.5962 |
| | 0.5936 | 0.7956 | 0.6326 |
| 16/8 | 1.7077 | 1.6544 | 1.6360 |
| | 0.7564 | 0.7280 | 0.6278 |

SEGMENT 2 VARIABLE 47 DWELLM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5025 | 1.0704 | 0.5240 |
| | 0.1897 | 0.7012 | 0.3819 |
| 8/4 | 0.5268 | 0.9702 | 0.4723 |
| | 0.2139 | 0.5903 | 0.1250 |
| 16/8 | 0.5767 | 1.1925 | 0.5481 |
| | 0.4787 | 0.9213 | 0.3076 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.4040 | 0.5107 | 0.3442 |
| | 0.1838 | 0.2896 | 0.1357 |
| 8/4 | 0.3699 | 0.4770 | 0.2970 |
| | 0.1901 | 0.2880 | 0.0718 |
| 16/8 | 0.2861 | 0.3573 | 0.2827 |
| | 0.0671 | 0.1946 | 0.0868 |

SEGMENT 2 VARIABLE 48 DWELLS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.4454 | 0.9899 | 0.5487 |
| | 0.2280 | 0.7454 | 0.7336 |
| 8/4 | 0.4683 | 0.8762 | 0.4328 |
| | 0.2632 | 0.6097 | 0.1412 |
| 16/8 | 0.5903 | 1.2512 | 0.5719 |
| | 0.8083 | 1.2201 | 0.5828 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3283 | 0.5159 | 0.2928 |
| | 0.1718 | 0.4580 | 0.2460 |
| 8/4 | 0.3094 | 0.4562 | 0.2269 |
| | 0.2573 | 0.4100 | 0.0782 |
| 16/8 | 0.2078 | 0.3174 | 0.2149 |
| | 0.0720 | 0.2978 | 0.0933 |

SEGMENT 2 VARIABLE 49 FIXRATE

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.2106 | 1.3079 | 2.1837 |
| | 0.6718 | 0.6678 | 0.5656 |
| 8/4 | 2.1526 | 1.4343 | 2.1905 |
| | 0.6872 | 0.7175 | 0.4794 |
| 16/8 | 2.1806 | 1.4264 | 2.0921 |
| | 0.7272 | 0.8804 | 0.6680 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.9336 | 2.5324 | 3.1977 |
| | 0.7319 | 0.8999 | 0.7894 |
| 8/4 | 3.1305 | 2.6952 | 3.3237 |
| | 0.8662 | 0.9694 | 0.5656 |
| 16/8 | 3.4404 | 3.0913 | 3.3796 |
| | 0.5777 | 0.6998 | 0.5385 |

SEGMENT 2 VARIABLE 50 BLINKR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1109 | 0.1204 | 0.0866 |
| | 0.0636 | 0.0929 | 0.0741 |
| 8/4 | 0.1538 | 0.1424 | 0.1576 |
| | 0.1220 | 0.1236 | 0.3890 |
| 16/8 | 0.1353 | 0.1297 | 0.0789 |
| | 0.1284 | 0.1159 | 0.0704 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.4467 | 0.4779 | 0.3683 |
| | 0.9441 | 0.9466 | 0.5538 |
| 8/4 | 0.3282 | 0.3687 | 0.2678 |
| | 0.3824 | 0.3303 | 0.1830 |
| 16/8 | 0.4727 | 0.5213 | 0.4291 |
| | 0.3717 | 0.6711 | 0.3226 |

SEGMENT 2 VARIABLE 51 PUPILD

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 5.5670 | 5.9179 | 5.4489 |
| | 1.3259 | 1.4235 | 1.3622 |
| 8/4 | 5.6519 | 5.8203 | 5.5330 |
| | 1.1693 | 1.2013 | 1.3521 |
| 16/8 | 5.8141 | 5.9408 | 5.7553 |
| | 1.1886 | 1.2577 | 1.3039 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 5.3614 | 5.4141 | 5.3167 |
| | 1.3848 | 1.3931 | 1.4064 |
| 8/4 | 5.3500 | 5.4438 | 5.3771 |
| | 1.2829 | 1.1777 | 1.2868 |
| 16/8 | 5.5396 | 5.4915 | 5.4978 |
| | 1.1937 | 1.1286 | 1.3655 |

SEGMENT 3 VARIABLE 1 EMGARM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 15.9481 | 16.9106 | 17.1081 |
| | 7.7018 | 8.0760 | 7.6929 |
| 8/4 | 16.8917 | 16.9908 | 17.3401 |
| | 7.6368 | 7.4113 | 8.4646 |
| 16/8 | 17.2429 | 17.4624 | 17.2667 |
| | 7.5526 | 7.5654 | 6.9299 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 17.7338 | 20.2661 | 19.0329 |
| | 8.2194 | 9.6711 | 8.4105 |
| 8/4 | 18.8398 | 21.0685 | 18.5770 |
| | 8.0450 | 9.4373 | 6.5660 |
| 16/8 | 20.9799 | 22.3548 | 21.7892 |
| | 8.5170 | 9.6977 | 9.5622 |

SEGMENT 3 VARIABLE 2 EMGARS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 10.4843 | 11.4463 | 11.6918 |
| | 5.3613 | 5.5374 | 5.1032 |
| 8/4 | 11.4230 | 11.4203 | 11.7684 |
| | 5.3270 | 5.0013 | 6.1648 |
| 16/8 | 11.5450 | 11.9420 | 11.9547 |
| | 5.6072 | 5.4298 | 5.0550 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 12.4869 | 14.1368 | 12.6167 |
| | 6.5832 | 6.5856 | 5.7519 |
| 8/4 | 12.6703 | 14.3739 | 13.1207 |
| | 6.0942 | 7.1010 | 4.9703 |
| 16/8 | 14.4244 | 15.9811 | 15.4736 |
| | 6.3809 | 6.8055 | 7.4093 |

SEGMENT 3 VARIABLE 4 EMGALR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 13.0535 | 14.4074 | 12.4387 |
| | 5.4193 | 6.8125 | 5.1264 |
| 8/4 | 13.7932 | 14.8438 | 12.6317 |
| | 6.1706 | 8.4443 | 6.6048 |
| 16/8 | 14.0967 | 16.2221 | 13.2649 |
| | 6.7439 | 8.1514 | 6.1193 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 14.1794 | 15.5250 | 12.3295 |
| | 6.9971 | 8.5131 | 6.5528 |
| 8/4 | 15.6454 | 16.7013 | 13.9671 |
| | 9.8866 | 10.0296 | 6.9635 |
| 16/8 | 16.7637 | 16.7574 | 15.0136 |
| | 9.6243 | 9.8864 | 8.0072 |

SEGMENT 3 VARIABLE 5 EMGALS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 9.1004 | 10.1404 | 8.7723 |
| | 4.1839 | 5.1662 | 3.8146 |
| 8/4 | 9.5823 | 10.5496 | 8.9637 |
| | 4.7488 | 6.4580 | 4.7190 |
| 16/8 | 9.8554 | 11.9789 | 9.3119 |
| | 5.1591 | 6.5738 | 4.4600 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 10.1497 | 11.3605 | 8.6344 |
| | 5.1663 | 6.3106 | 4.7237 |
| 8/4 | 11.1381 | 11.8720 | 10.0579 |
| | 7.3686 | 7.4272 | 4.9316 |
| 16/8 | 11.7694 | 12.0622 | 10.6004 |
| | 6.7318 | 7.4383 | 5.4688 |

SEGMENT 3 VARIABLE 7 RESAMP

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 143.7879 | 140.9213 | 142.6782 |
| | 52.6647 | 48.6154 | 53.6968 |
| 8/4 | 139.2854 | 141.2215 | 138.4792 |
| | 48.9073 | 50.8090 | 49.1372 |
| 16/8 | 141.4294 | 140.3400 | 141.4009 |
| | 49.4428 | 42.8729 | 49.8026 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 143.7482 | 139.1166 | 144.0585 |
| | 55.4880 | 50.6675 | 47.5810 |
| 8/4 | 139.3396 | 137.2919 | 143.1186 |
| | 48.3701 | 45.7734 | 47.0364 |
| 16/8 | 136.2108 | 137.3044 | 145.1432 |
| | 43.0945 | 45.8434 | 46.6244 |

SEGMENT 3 VARIABLE 8 RESAMS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 21.3087 | 21.8907 | 21.3900 |
| | 11.2110 | 14.4962 | 9.2214 |
| 8/4 | 24.7726 | 25.6952 | 19.1380 |
| | 19.0992 | 18.0097 | 7.5229 |
| 16/8 | 26.4591 | 21.6257 | 24.9631 |
| | 19.5416 | 8.1355 | 16.5421 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 26.6747 | 21.3049 | 21.9574 |
| | 20.1011 | 9.3877 | 9.8829 |
| 8/4 | 23.8757 | 21.3924 | 23.3661 |
| | 11.8503 | 9.5221 | 11.6649 |
| 16/8 | 25.4441 | 26.5152 | 27.1935 |
| | 10.5868 | 10.7517 | 20.6866 |

SEGMENT 3 VARIABLE 9 RESPDM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.7195 | 2.6021 | 2.6126 |
| | 0.3752 | 0.3411 | 0.3090 |
| 8/4 | 2.6729 | 2.5808 | 2.5839 |
| | 0.3941 | 0.3724 | 0.3117 |
| 16/8 | 2.5718 | 2.5268 | 2.5806 |
| | 0.2964 | 0.3263 | 0.3841 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.5358 | 2.5155 | 2.6007 |
| | 0.3197 | 0.4982 | 0.4786 |
| 8/4 | 2.7735 | 2.6458 | 2.4310 |
| | 1.6640 | 0.7888 | 0.3417 |
| 16/8 | 2.7004 | 2.4197 | 2.4466 |
| | 2.0134 | 0.4325 | 0.6788 |

SEGMENT 3 VARIABLE 10 RESPDS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.2484 | 0.2183 | 0.2251 |
| | 0.1802 | 0.1028 | 0.0964 |
| 8/4 | 0.2798 | 0.3075 | 0.2563 |
| | 0.1863 | 0.2974 | 0.1979 |
| 16/8 | 0.2324 | 0.2085 | 0.2671 |
| | 0.1128 | 0.0868 | 0.2029 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3079 | 0.3631 | 0.3217 |
| | 0.2420 | 0.5208 | 0.4062 |
| 8/4 | 0.3582 | 0.4322 | 0.2992 |
| | 0.6592 | 0.7240 | 0.2238 |
| 16/8 | 0.2807 | 0.3452 | 0.3028 |
| | 0.1970 | 0.3745 | 0.2779 |

SEGMENT 3 VARIABLE 13 ECGRAM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 245.6253 | 246.6401 | 244.4693 |
| | 95.3290 | 95.1115 | 94.1354 |
| 8/4 | 242.9621 | 246.9642 | 243.8627 |
| | 92.8967 | 95.1936 | 93.6151 |
| 16/8 | 245.8581 | 247.1077 | 242.3693 |
| | 93.5370 | 94.8725 | 91.9543 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 246.8905 | 251.1355 | 249.8946 |
| | 93.6033 | 94.6931 | 94.6884 |
| 8/4 | 246.5082 | 246.8025 | 247.2586 |
| | 94.5288 | 94.1272 | 94.6764 |
| 16/8 | 243.0157 | 242.7926 | 247.4874 |
| | 92.2745 | 91.9962 | 95.1550 |

SEGMENT 3 VARIABLE 14 ECGRAS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 18.1702 | 17.8398 | 23.8857 |
| | 19.5382 | 18.2749 | 24.3012 |
| 8/4 | 22.9150 | 18.9402 | 23.3336 |
| | 23.4913 | 20.0924 | 25.2151 |
| 16/8 | 18.3400 | 17.0343 | 22.8410 |
| | 20.8597 | 19.0989 | 22.6942 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 23.4919 | 22.9261 | 19.4302 |
| | 24.5790 | 21.5595 | 19.0195 |
| 8/4 | 22.1806 | 21.0373 | 27.0470 |
| | 22.6285 | 21.9810 | 22.4825 |
| 16/8 | 24.2552 | 27.0048 | 22.2375 |
| | 23.7448 | 24.3511 | 20.6792 |

SEGMENT 3 VARIABLE 15 ECGRDM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7212 | 0.7091 | 0.7144 |
| | 0.0870 | 0.0734 | 0.0844 |
| 8/4 | 0.7093 | 0.6961 | 0.6963 |
| | 0.0624 | 0.0752 | 0.0878 |
| 16/8 | 0.7131 | 0.6865 | 0.7005 |
| | 0.0780 | 0.0722 | 0.0749 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.7104 | 0.7153 | 0.7047 |
| | 0.0823 | 0.0728 | 0.0954 |
| 8/4 | 0.7023 | 0.6963 | 0.6890 |
| | 0.0826 | 0.0757 | 0.0849 |
| 16/8 | 0.6846 | 0.6727 | 0.6981 |
| | 0.0797 | 0.0809 | 0.0845 |

SEGMENT 3 VARIABLE 16 ECGRDS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0834 | 0.0930 | 0.0856 |
| | 0.0497 | 0.0538 | 0.0495 |
| 8/4 | 0.0882 | 0.0841 | 0.0834 |
| | 0.0560 | 0.0428 | 0.0415 |
| 16/8 | 0.0888 | 0.0817 | 0.0918 |
| | 0.0480 | 0.0493 | 0.0515 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0922 | 0.0995 | 0.0810 |
| | 0.0467 | 0.0499 | 0.0446 |
| 8/4 | 0.1033 | 0.1118 | 0.1135 |
| | 0.0564 | 0.0653 | 0.0513 |
| 16/8 | 0.1066 | 0.1021 | 0.1180 |
| | 0.0541 | 0.0693 | 0.0619 |

SEGMENT 3 VARIABLE 17 ECGP/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0057 | 0.0043 | 0.0060 |
| | 0.0294 | 0.0275 | 0.0282 |
| 8/4 | 0.0069 | 0.0041 | 0.0105 |
| | 0.0288 | 0.0289 | 0.0303 |
| 16/8 | 0.0041 | 0.0071 | 0.0035 |
| | 0.0285 | 0.0267 | 0.0292 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0114 | 0.0111 | 0.0110 |
| | 0.0311 | 0.0329 | 0.0318 |
| 8/4 | 0.0133 | 0.0090 | 0.0147 |
| | 0.0334 | 0.0306 | 0.0312 |
| 16/8 | 0.0112 | 0.0154 | 0.0117 |
| | 0.0331 | 0.0333 | 0.0301 |

SEGMENT 3 VARIABLE 18 ECGQ/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1450 | -0.1491 | -0.1490 |
| | 0.0692 | 0.0736 | 0.0705 |
| 8/4 | -0.1406 | -0.1489 | -0.1431 |
| | 0.0648 | 0.0681 | 0.0645 |
| 16/8 | -0.1486 | -0.1478 | -0.1451 |
| | 0.0726 | 0.0712 | 0.0688 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1464 | -0.1470 | -0.1531 |
| | 0.0622 | 0.0638 | 0.0685 |
| 8/4 | -0.1487 | -0.1540 | -0.1447 |
| | 0.0644 | 0.0691 | 0.0538 |
| 16/8 | -0.1539 | -0.1575 | -0.1505 |
| | 0.0636 | 0.0676 | 0.0611 |

SEGMENT 3 VARIABLE 20 ECGS/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1707 | -0.1715 | -0.1717 |
| | 0.0630 | 0.0632 | 0.0635 |
| 8/4 | -0.1741 | -0.1712 | -0.1725 |
| | 0.0611 | 0.0599 | 0.0561 |
| 16/8 | -0.1695 | -0.1740 | -0.1682 |
| | 0.0575 | 0.0595 | 0.0561 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | -0.1767 | -0.1805 | -0.1743 |
| | 0.0654 | 0.0664 | 0.0674 |
| 8/4 | -0.1806 | -0.1854 | -0.1823 |
| | 0.0636 | 0.0678 | 0.0622 |
| 16/8 | -0.1901 | -0.1880 | -0.1895 |
| | 0.0678 | 0.0660 | 0.0627 |

SEGMENT 3 VARIABLE 21 ECGT/R

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1511 | 0.1547 | 0.1590 |
| | 0.0657 | 0.0699 | 0.0723 |
| 8/4 | 0.1595 | 0.1574 | 0.1529 |
| | 0.0655 | 0.0638 | 0.0630 |
| 16/8 | 0.1554 | 0.1594 | 0.1597 |
| | 0.0636 | 0.0714 | 0.0722 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1458 | 0.1416 | 0.1517 |
| | 0.0615 | 0.0565 | 0.0676 |
| 8/4 | 0.1502 | 0.1548 | 0.1480 |
| | 0.0658 | 0.0665 | 0.0632 |
| 16/8 | 0.1579 | 0.1565 | 0.1553 |
| | 0.0690 | 0.0659 | 0.0640 |

SEGMENT 3 VARIABLE 22 ECGPIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0232 | 0.0470 | 0.0465 |
| | 0.0531 | 0.0701 | 0.0763 |
| 8/4 | 0.0484 | 0.0440 | 0.0512 |
| | 0.0698 | 0.0666 | 0.0715 |
| 16/8 | 0.0586 | 0.0489 | 0.0493 |
| | 0.0764 | 0.0737 | 0.0715 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0469 | 0.0597 | 0.0560 |
| | 0.0651 | 0.0740 | 0.0721 |
| 8/4 | 0.0629 | 0.0745 | 0.0759 |
| | 0.0762 | 0.0801 | 0.0766 |
| 16/8 | 0.0562 | 0.0602 | 0.0634 |
| | 0.0683 | 0.0675 | 0.0709 |

SEGMENT 3 VARIABLE 23 ECGQIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1931 | 0.1793 | 0.1924 |
| | 0.0946 | 0.0960 | 0.0953 |
| 8/4 | 0.1893 | 0.1926 | 0.1801 |
| | 0.0939 | 0.0952 | 0.0920 |
| 16/8 | 0.1859 | 0.1796 | 0.1934 |
| | 0.0959 | 0.0958 | 0.0947 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1823 | 0.1862 | 0.1826 |
| | 0.0951 | 0.0928 | 0.0953 |
| 8/4 | 0.1778 | 0.1785 | 0.1672 |
| | 0.0976 | 0.0972 | 0.0954 |
| 16/8 | 0.1834 | 0.1796 | 0.1890 |
| | 0.0959 | 0.0979 | 0.0951 |

SEGMENT 3 VARIABLE 24 ECGRIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0394 | 0.0394 | 0.0395 |
| | 0.0056 | 0.0057 | 0.0062 |
| 8/4 | 0.0391 | 0.0396 | 0.0394 |
| | 0.0055 | 0.0062 | 0.0057 |
| 16/8 | 0.0390 | 0.0391 | 0.0395 |
| | 0.0052 | 0.0057 | 0.0060 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0389 | 0.0388 | 0.0386 |
| | 0.0061 | 0.0061 | 0.0055 |
| 8/4 | 0.0383 | 0.0381 | 0.0383 |
| | 0.0055 | 0.0056 | 0.0058 |
| 16/8 | 0.0378 | 0.0379 | 0.0380 |
| | 0.0058 | 0.0062 | 0.0061 |

SEGMENT 3 VARIABLE 25 ECGSIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1457 | 0.1435 | 0.1432 |
| | 0.0303 | 0.0284 | 0.0272 |
| 8/4 | 0.1433 | 0.1407 | 0.1430 |
| | 0.0237 | 0.0243 | 0.0244 |
| 16/8 | 0.1417 | 0.1406 | 0.1425 |
| | 0.0246 | 0.0223 | 0.0246 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1447 | 0.1415 | 0.1403 |
| | 0.0285 | 0.0279 | 0.0272 |
| 8/4 | 0.1391 | 0.1403 | 0.1416 |
| | 0.0234 | 0.0247 | 0.0208 |
| 16/8 | 0.1395 | 0.1376 | 0.1401 |
| | 0.0231 | 0.0214 | 0.0217 |

SEGMENT 3 VARIABLE 26 ECGTIN

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1288 | 0.1278 | 0.1311 |
| | 0.0292 | 0.0298 | 0.0343 |
| 8/4 | 0.1312 | 0.1291 | 0.1289 |
| | 0.0308 | 0.0310 | 0.0283 |
| 16/8 | 0.1301 | 0.1276 | 0.1311 |
| | 0.0257 | 0.0268 | 0.0314 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1255 | 0.1275 | 0.1275 |
| | 0.0350 | 0.0356 | 0.0319 |
| 8/4 | 0.1265 | 0.1230 | 0.1198 |
| | 0.0337 | 0.0344 | 0.0319 |
| 16/8 | 0.1231 | 0.1222 | 0.1224 |
| | 0.0308 | 0.0319 | 0.0326 |

SEGMENT 3 VARIABLE 31 PITCH

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1040 | 0.1656 | 0.1000 |
| | 0.0681 | 0.0776 | 0.0462 |
| 8/4 | 0.1315 | 0.1701 | 0.0983 |
| | 0.0707 | 0.0609 | 0.0502 |
| 16/8 | 0.1555 | 0.1682 | 0.1189 |
| | 0.0710 | 0.0653 | 0.0635 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1143 | 0.1545 | 0.0824 |
| | 0.0622 | 0.0656 | 0.0460 |
| 8/4 | 0.1224 | 0.1564 | 0.1045 |
| | 0.0597 | 0.0789 | 0.0625 |
| 16/8 | 0.1431 | 0.1673 | 0.1119 |
| | 0.0842 | 0.0534 | 0.0670 |

SEGMENT 3 VARIABLE 32 ROLL

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1161 | 0.1447 | 0.1648 |
| | 0.0479 | 0.0702 | 0.0858 |
| 8/4 | 0.1501 | 0.1771 | 0.1739 |
| | 0.0652 | 0.0725 | 0.0996 |
| 16/8 | 0.1686 | 0.1859 | 0.2212 |
| | 0.0628 | 0.0770 | 0.1213 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1024 | 0.1500 | 0.1327 |
| | 0.0545 | 0.0907 | 0.1166 |
| 8/4 | 0.1284 | 0.1758 | 0.1778 |
| | 0.0613 | 0.1051 | 0.1427 |
| 16/8 | 0.2105 | 0.2242 | 0.2188 |
| | 0.1074 | 0.1015 | 0.1339 |

SEGMENT 3 VARIABLE 33 POWER

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0941 | 0.1524 | 0.1272 |
| | 0.0607 | 0.1177 | 0.1029 |
| 8/4 | 0.1175 | 0.1977 | 0.1047 |
| | 0.0757 | 0.1436 | 0.0612 |
| 16/8 | 0.1730 | 0.2342 | 0.1782 |
| | 0.0910 | 0.1515 | 0.0875 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1206 | 0.1872 | 0.0758 |
| | 0.0820 | 0.1422 | 0.0446 |
| 8/4 | 0.1135 | 0.1918 | 0.1225 |
| | 0.0520 | 0.1433 | 0.0738 |
| 16/8 | 0.2042 | 0.2451 | 0.1775 |
| | 0.0872 | 0.1393 | 0.0987 |

SEGMENT 3 VARIABLE 34 HEADING

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1512 | 0.2112 | 0.4453 |
| | 0.0672 | 0.1615 | 0.2271 |
| 8/4 | 0.1541 | 0.2177 | 0.4161 |
| | 0.0694 | 0.1582 | 0.2261 |
| 16/8 | 0.2074 | 0.2405 | 0.4542 |
| | 0.1374 | 0.1612 | 0.2010 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.1472 | 0.1768 | 0.3904 |
| | 0.1114 | 0.1150 | 0.1855 |
| 8/4 | 0.1754 | 0.2022 | 0.3649 |
| | 0.1402 | 0.1768 | 0.1752 |
| 16/8 | 0.2384 | 0.2889 | 0.3828 |
| | 0.1315 | 0.1804 | 0.1742 |

SEGMENT 3 VARIABLE 35 ROLLAC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.6551 | 2.9852 | 3.9353 |
| | 0.6216 | 1.3062 | 1.6007 |
| 8/4 | 2.9318 | 3.1999 | 3.9842 |
| | 0.7444 | 0.9116 | 1.2842 |
| 16/8 | 3.8899 | 3.8612 | 5.0199 |
| | 0.8842 | 1.0933 | 2.1112 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 3.1525 | 3.7148 | 4.0610 |
| | 1.2563 | 1.6692 | 1.4399 |
| 8/4 | 3.1916 | 3.8464 | 4.7295 |
| | 1.1260 | 1.4545 | 2.2964 |
| 16/8 | 4.8819 | 5.2304 | 5.6158 |
| | 1.3308 | 1.9874 | 1.9146 |

SEGMENT 3 VARIABLE 36 PITCHAC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.1177 | 1.3167 | 1.6491 |
| | 0.4228 | 0.7512 | 0.8561 |
| 8/4 | 1.1627 | 1.5132 | 1.6260 |
| | 0.3605 | 0.7047 | 0.9057 |
| 16/8 | 1.3964 | 1.6665 | 2.0521 |
| | 0.5455 | 0.9371 | 0.9894 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.4378 | 2.0458 | 1.8592 |
| | 0.9560 | 1.3225 | 1.0006 |
| 8/4 | 1.4411 | 2.0622 | 2.1626 |
| | 0.7587 | 1.2989 | 1.3405 |
| 16/8 | 1.8664 | 2.6005 | 2.4681 |
| | 1.2050 | 1.7139 | 1.8601 |

SEGMENT 3 VARIABLE 37 YAWACC

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.5976 | 3.1577 | 4.1020 |
| | 1.0703 | 2.2350 | 3.5464 |
| 8/4 | 3.0483 | 3.4521 | 3.8505 |
| | 1.6043 | 1.4856 | 2.5438 |
| 16/8 | 3.7786 | 3.6650 | 5.3064 |
| | 1.8577 | 2.1659 | 5.4050 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.8046 | 2.2947 | 2.4337 |
| | 0.6420 | 1.0650 | 1.5860 |
| 8/4 | 2.2545 | 2.8692 | 3.1705 |
| | 0.9172 | 1.8849 | 2.2113 |
| 16/8 | 3.1384 | 3.6609 | 3.7080 |
| | 1.3860 | 1.6140 | 2.4073 |

SEGMENT 3 VARIABLE 38 SPEEDER

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 3.0386 | 6.1492 | 4.5334 |
| | 3.1602 | 4.9876 | 5.5818 |
| 8/4 | 4.0927 | 6.7405 | 3.4152 |
| | 5.1670 | 4.5011 | 3.7873 |
| 16/8 | 6.2433 | 6.3615 | 4.3017 |
| | 5.9759 | 4.8585 | 3.2113 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 4.6799 | 7.4138 | 2.3265 |
| | 5.1202 | 6.7858 | 1.7614 |
| 8/4 | 3.7915 | 5.8898 | 3.5022 |
| | 3.1705 | 5.1973 | 3.2427 |
| 16/8 | 7.7983 | 8.4653 | 5.7753 |
| | 8.5199 | 6.7078 | 7.0241 |

SEGMENT 3 VARIABLE 39 S/PITCH

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.6726 | 0.6825 | 0.6787 |
| | 0.0174 | 0.0223 | 0.0184 |
| 8/4 | 0.6677 | 0.6771 | 0.6711 |
| | 0.0192 | 0.0199 | 0.0160 |
| 16/8 | 0.6719 | 0.6737 | 0.6741 |
| | 0.0198 | 0.0231 | 0.0184 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.6755 | 0.6856 | 0.6779 |
| | 0.0156 | 0.0237 | 0.0140 |
| 8/4 | 0.6718 | 0.6761 | 0.6738 |
| | 0.0148 | 0.0174 | 0.0174 |
| 16/8 | 0.6859 | 0.6876 | 0.6755 |
| | 0.0212 | 0.0234 | 0.0229 |

SEGMENT 3 VARIABLE 40 S/ROLL

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.0289 | 1.0322 | 1.0335 |
| | 0.0059 | 0.0085 | 0.0284 |
| 8/4 | 0.9971 | 0.9997 | 1.0012 |
| | 0.0111 | 0.0135 | 0.0175 |
| 16/8 | 0.9646 | 0.9716 | 0.9732 |
| | 0.0181 | 0.0260 | 0.0236 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.0283 | 1.0336 | 1.0253 |
| | 0.0057 | 0.0099 | 0.0072 |
| 8/4 | 0.9968 | 0.9976 | 1.0018 |
| | 0.0097 | 0.0136 | 0.0214 |
| 16/8 | 0.9758 | 0.9771 | 0.9758 |
| | 0.0307 | 0.0259 | 0.0309 |

SEGMENT 3 VARIABLE 41 S/YAW

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5663 | 0.5681 | 0.5544 |
| | 0.0077 | 0.0104 | 0.0265 |
| 8/4 | 0.5919 | 0.5908 | 0.5831 |
| | 0.0165 | 0.0162 | 0.0168 |
| 16/8 | 0.6104 | 0.6129 | 0.5990 |
| | 0.0190 | 0.0196 | 0.0226 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5588 | 0.5693 | 0.5558 |
| | 0.0133 | 0.0153 | 0.0124 |
| 8/4 | 0.5854 | 0.5865 | 0.5752 |
| | 0.0142 | 0.0186 | 0.0202 |
| 16/8 | 0.6105 | 0.6040 | 0.5972 |
| | 0.0208 | 0.0236 | 0.0246 |

SEGMENT 3 VARIABLE 42 POWSET

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.4982 | 0.5091 | 0.5081 |
| | 0.0238 | 0.0283 | 0.0244 |
| 8/4 | 0.4982 | 0.5089 | 0.5106 |
| | 0.0250 | 0.0311 | 0.0263 |
| 16/8 | 0.5033 | 0.4993 | 0.5121 |
| | 0.0252 | 0.0260 | 0.0266 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5084 | 0.5110 | 0.5115 |
| | 0.0280 | 0.0303 | 0.0217 |
| 8/4 | 0.5065 | 0.5123 | 0.5141 |
| | 0.0264 | 0.0301 | 0.0271 |
| 16/8 | 0.5166 | 0.5159 | 0.5132 |
| | 0.0212 | 0.0325 | 0.0335 |

SEGMENT 3 VARIABLE 43 ALTERR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 4.8347 | 8.3821 | 6.5231 |
| | 3.2461 | 6.9502 | 6.5373 |
| 8/4 | 5.8182 | 11.7439 | 4.8003 |
| | 4.2876 | 11.2757 | 3.3813 |
| 16/8 | 9.4362 | 14.4307 | 9.3552 |
| | 9.5106 | 16.5954 | 6.0439 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 6.4553 | 10.5774 | 4.3041 |
| | 5.4788 | 10.5892 | 4.2319 |
| 8/4 | 6.1067 | 10.8182 | 6.2386 |
| | 3.2984 | 9.6424 | 4.9791 |
| 16/8 | 13.3388 | 17.0560 | 9.9251 |
| | 9.5174 | 19.4978 | 11.5736 |

SEGMENT 3 VARIABLE 44 CXERR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 19.4286 | 24.0516 | 67.2487 |
| | 10.9292 | 14.7630 | 187.7090 |
| 8/4 | 27.9853 | 39.6808 | 34.2910 |
| | 16.4558 | 33.5546 | 35.6653 |
| 16/8 | 70.4190 | 110.9762 | 107.7403 |
| | 60.1378 | 228.6744 | 140.0741 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 18.7158 | 28.9320 | 31.3792 |
| | 13.2651 | 24.5223 | 58.5156 |
| 8/4 | 29.3994 | 48.3053 | 131.9552 |
| | 19.0170 | 61.1404 | 431.1321 |
| 16/8 | 138.4967 | 175.7828 | 348.2080 |
| | 145.2935 | 250.9131 | 934.9590 |

SEGMENT 3 VARIABLE 45 SACCLM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.3897 | 0.9549 | 1.4659 |
| | 0.4253 | 0.5950 | 0.8412 |
| 8/4 | 1.3366 | 1.0193 | 1.4168 |
| | 0.5138 | 0.6516 | 0.4341 |
| 16/8 | 1.3652 | 1.0916 | 1.5243 |
| | 0.7638 | 1.1072 | 0.7072 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.4522 | 1.2732 | 1.5108 |
| | 0.6095 | 0.6677 | 0.5416 |
| 8/4 | 1.4329 | 1.3661 | 1.4593 |
| | 0.6140 | 0.9387 | 0.4221 |
| 16/8 | 1.3271 | 1.1687 | 1.5657 |
| | 0.3702 | 0.3871 | 0.7290 |

SEGMENT 3 VARIABLE 46 SACCLS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.3122 | 0.9984 | 1.1068 |
| | 0.7231 | 0.9582 | 0.7197 |
| 8/4 | 1.1970 | 1.1481 | 1.2048 |
| | 0.8326 | 1.0161 | 0.7283 |
| 16/8 | 1.1267 | 1.0575 | 1.1638 |
| | 0.8285 | 1.0269 | 0.7337 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.4267 | 1.3447 | 1.3564 |
| | 0.7921 | 0.7893 | 0.6489 |
| 8/4 | 1.3876 | 1.4020 | 1.3301 |
| | 0.7301 | 0.8859 | 0.6065 |
| 16/8 | 1.2220 | 1.2102 | 1.3907 |
| | 0.6001 | 0.5883 | 0.8206 |

SEGMENT 3 VARIABLE 47 DWELLM

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5997 | 1.2693 | 0.6454 |
| | 0.2011 | 0.8633 | 0.6147 |
| 8/4 | 0.6219 | 1.2959 | 0.5434 |
| | 0.3006 | 0.8040 | 0.1734 |
| 16/8 | 0.6374 | 1.2842 | 0.5846 |
| | 0.3787 | 0.8737 | 0.3248 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.4434 | 0.5462 | 0.4114 |
| | 0.1935 | 0.3163 | 0.2504 |
| 8/4 | 0.4644 | 0.5508 | 0.3571 |
| | 0.3388 | 0.3275 | 0.1085 |
| 16/8 | 0.3480 | 0.4326 | 0.3940 |
| | 0.1148 | 0.2518 | 0.5590 |

SEGMENT 3 VARIABLE 48 DWELLS

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.5613 | 1.1094 | 0.6810 |
| | 0.2715 | 0.8653 | 0.8568 |
| 8/4 | 0.5955 | 1.2124 | 0.5299 |
| | 0.4026 | 0.9534 | 0.2232 |
| 16/8 | 0.5971 | 1.2535 | 0.5794 |
| | 0.4941 | 1.0871 | 0.5203 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3694 | 0.5386 | 0.3939 |
| | 0.2327 | 0.4750 | 0.4375 |
| 8/4 | 0.4386 | 0.5467 | 0.3015 |
| | 0.5207 | 0.5034 | 0.1038 |
| 16/8 | 0.2859 | 0.4008 | 0.3026 |
| | 0.1526 | 0.3436 | 0.4527 |

SEGMENT 3 VARIABLE 49 FIXRATE

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 1.8211 | 1.1510 | 1.8449 |
| | 0.5851 | 0.6455 | 0.7279 |
| 8/4 | 1.9009 | 1.1046 | 1.9444 |
| | 0.7236 | 0.5985 | 0.4750 |
| 16/8 | 1.8859 | 1.1646 | 1.8851 |
| | 0.7037 | 0.6808 | 0.5347 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 2.7144 | 2.4262 | 2.8332 |
| | 0.7695 | 0.9043 | 0.8204 |
| 8/4 | 2.7808 | 2.2692 | 2.9704 |
| | 0.9726 | 0.8628 | 0.7035 |
| 16/8 | 3.0549 | 2.7197 | 3.2826 |
| | 0.7224 | 0.7496 | 0.7622 |

SEGMENT 3 VARIABLE 50 BLINKR

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.0907 | 0.1613 | 0.0968 |
| | 0.0702 | 0.2252 | 0.0853 |
| 8/4 | 0.1373 | 0.1165 | 0.0985 |
| | 0.0962 | 0.1050 | 0.0926 |
| 16/8 | 0.1006 | 0.1276 | 0.0807 |
| | 0.1160 | 0.1349 | 0.0590 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 0.3666 | 0.4017 | 0.2604 |
| | 0.4471 | 0.4582 | 0.2935 |
| 8/4 | 0.2846 | 0.5069 | 0.3057 |
| | 0.2583 | 0.7330 | 0.4718 |
| 16/8 | 0.2858 | 0.4939 | 0.3035 |
| | 0.2321 | 0.6914 | 0.2772 |

SEGMENT 3 VARIABLE 51 PUPILD

MOTION = NO

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 5.6832 | 6.0248 | 5.6626 |
| | 1.3648 | 1.4045 | 1.5909 |
| 8/4 | 5.6767 | 6.0425 | 5.7042 |
| | 1.1186 | 1.1617 | 1.2478 |
| 16/8 | 5.9038 | 6.0540 | 5.9430 |
| | 1.2011 | 1.2894 | 1.4844 |

MOTION = YES

| | GRAPH I | GRAPH II | F-DIR |
|---|---|---|---|
| 0/0 | 5.3644 | 5.3987 | 5.4381 |
| | 1.3268 | 1.3406 | 1.5621 |
| 8/4 | 5.5143 | 5.4940 | 5.4198 |
| | 1.2908 | 1.2421 | 1.4104 |
| 16/8 | 5.6506 | 5.5419 | 5.5207 |
| | 1.1863 | 1.2400 | 1.4249 |

# APPENDIX B

# CORRELATION MATRICES

CORRELATION MATRIX APPROACH SEGMENT

1 EMGARM

1.000 0.943 0.483 0.445 -0.225 -0.149 -0.171 0.128 0.120 -0.058
-0.008 -0.181 -0.242 -0.121 -0.236 0.141 -0.302 0.368 -0.263 -0.147
0.014 -0.181 0.363 0.155 -0.220 0.043 -0.109 -0.165 -0.011 0.040
0.252 -0.041 -0.095 0.041 -0.141 0.019 0.147 0.195 -0.055 -0.052
0.123 0.104 -0.099 -0.025 0.041 -0.027

2 EMGARS

0.943 1.000 0.500 0.468 -0.159 -0.072 -0.161 0.145 0.200 -0.002
0.011 -0.144 -0.311 -0.155 -0.245 0.197 -0.349 0.446 -0.246 -0.209
-0.041 -0.150 0.555 0.128 0.252 0.054 -0.124 -0.171 -0.021 0.022
0.250 -0.067 -0.056 0.079 0.136 0.051 0.155 0.209 -0.012 -0.055
0.100 0.096 -0.068 -0.055 0.060 -0.056

3 EMGALM

0.483 0.500 1.000 0.466 -0.244 -0.182 -0.025 -0.051 -0.184 -0.150
0.197 -0.249 0.115 0.400 -0.590 -0.156 -0.060 0.007 -0.250 0.291
0.075 -0.278 0.289 0.071 -0.064 -0.054 0.029 -0.055 0.070 0.145
0.139 -0.108 -0.099 0.162 -0.090 -0.025 -0.082 -0.046 -0.067 -0.088
0.169 0.079 -0.594 0.042 0.155 0.056

4 EMGALS

0.445 0.468 0.466 1.000 -0.220 -0.135 -0.011 -0.049 -0.179 -0.117
0.217 -0.245 0.105 0.545 -0.295 -0.104 -0.078 0.052 -0.190 0.285
0.154 -0.291 0.245 0.012 -0.119 -0.093 0.019 -0.045 0.060 0.120
0.121 -0.098 -0.060 0.151 -0.134 -0.055 -0.094 -0.082 -0.069 -0.085
0.165 0.048 -0.359 0.028 0.140 0.038

5 RESAMP

-0.225 -0.159 -0.244 -0.220 1.000 0.568 -0.174 -0.115 0.600 0.445
-0.167 0.451 -0.543 -0.443 0.520 0.319 -0.062 0.226 0.206 -0.540
-0.412 0.521 -0.258 -0.060 0.035 -0.078 0.109 0.287 -0.027 -0.104
-0.194 0.115 0.267 -0.199 0.027 -0.005 0.088 0.079 0.089 0.122
-0.152 -0.079 0.546 -0.025 -0.042 -0.039

6 RESAMS

-0.149 -0.072 -0.182 -0.135 0.568 1.000 0.096 0.280 0.474 0.460
-0.015 0.512 -0.424 -0.451 0.571 0.434 -0.240 0.373 0.575 -0.405
-0.176 0.292 -0.227 -0.124 -0.115 -0.093 0.102 0.095 0.083 -0.097
-0.082 0.021 0.139 -0.071 -0.110 -0.017 -0.021 -0.057 0.055 0.061
-0.066 -0.059 0.581 0.085 -0.021 0.065

7 RESPDM

-0.171 -0.161 -0.025 -0.011 -0.174 0.096 1.000 0.424 -0.216 0.007
0.579 -0.224 -0.020 0.266 0.045 -0.072 -0.271 0.062 0.555 0.407
0.170 -0.454 -0.159 -0.525 -0.585 -0.125 -0.194 -0.549 -0.089 -0.191
-0.004 0.141 0.058 -0.059 -0.518 -0.056 -0.275 -0.548 0.128 0.157
-0.193 -0.121 -0.349 -0.114 -0.175 -0.105

8 RESPDS
0.128 0.143 -0.051 -0.049 -0.115 0.280 0.424 1.000 0.076 0.072
-0.046 0.065 -0.118 -0.126 0.050 0.124 -0.154 0.144 0.065 -0.092
-0.000 -0.031 -0.032 0.002 -0.006 -0.035 -0.058 -0.127 -0.033 -0.021
0.030 -0.037 -0.052 0.025 0.002 0.122 0.139 0.105 -0.048 -0.043
0.113 0.145 -0.011 -0.015 0.132 -0.021
9 ECGRAM
0.120 0.200 -0.184 -0.179 0.600 0.474 -0.216 0.076 1.000 0.492
0.131 0.337 -0.754 -0.541 0.124 0.597 -0.413 0.659 -0.024 -0.671
-0.392 0.516 -0.119 -0.017 0.098 -0.060 -0.095 0.011 -0.062 -0.187
-0.014 0.095 0.247 -0.171 0.052 -0.009 0.333 0.384 0.045 0.077
-0.084 -0.069 0.557 -0.061 -0.086 -0.069
10 ECGRAS
-0.058 -0.002 -0.130 -0.117 0.445 0.460 0.007 0.072 0.492 1.000
0.049 0.520 -0.581 -0.591 0.512 0.486 -0.273 0.574 0.297 -0.373
-0.160 0.316 -0.148 -0.078 -0.125 -0.101 0.002 0.016 0.042 -0.108
-0.091 0.051 0.196 -0.115 -0.124 -0.059 -0.042 -0.050 0.066 0.063
-0.109 -0.048 0.362 0.033 -0.081 0.021
11 ECGRDM
-0.008 0.011 0.197 0.217 -0.167 -0.015 0.579 -0.046 0.131 0.049
1.000 -0.255 -0.277 0.293 -0.250 0.126 -0.434 0.353 -0.055 0.384
0.173 -0.295 -0.020 -0.247 -0.362 -0.168 -0.214 -0.504 -0.118 -0.144
0.104 0.065 0.051 -0.024 -0.321 -0.131 -0.077 -0.084 -0.010 0.004
-0.015 -0.126 -0.343 -0.149 -0.041 -0.130
12 ECGRDS
-0.181 -0.144 -0.249 -0.245 0.451 0.512 -0.224 0.063 0.537 0.320
-0.255 1.000 -0.141 -0.328 0.262 0.255 0.179 -0.005 0.158 -0.450
-0.288 0.502 -0.165 0.075 0.101 0.052 0.162 0.296 0.028 0.078
-0.211 -0.006 0.094 -0.059 0.120 0.016 0.210 0.209 0.002 0.019
-0.013 0.064 0.477 0.061 0.018 0.048
13 ECGP/R
-0.242 -0.311 0.118 0.105 -0.543 -0.424 -0.020 -0.118 -0.754 -0.581
-0.277 -0.141 1.000 0.534 -0.245 -0.775 0.667 -0.877 -0.203 0.559
0.058 -0.234 0.037 0.134 -0.026 0.088 0.242 0.261 0.042 0.286
-0.082 -0.105 -0.298 0.182 0.022 0.072 -0.207 -0.215 -0.069 -0.085
0.117 0.143 -0.438 0.072 0.115 0.083
14 ECGQ/R
-0.121 -0.136 0.400 0.545 -0.443 -0.431 0.266 -0.126 -0.541 -0.591
0.293 -0.528 0.534 1.000 -0.599 -0.694 0.283 -0.520 -0.291 0.793
-0.026 -0.397 0.067 0.028 -0.138 0.062 0.049 -0.021 -0.048 0.069
0.022 0.026 -0.169 0.047 -0.071 0.012 -0.135 -0.094 -0.103 -0.120
0.120 0.009 -0.729 -0.049 0.055 -0.008
15 ECGS/R
-0.236 -0.243 -0.590 -0.293 0.320 0.371 0.045 0.050 0.124 0.512
-0.250 0.262 -0.245 -0.599 1.000 0.504 -0.126 0.198 0.633 -0.351
0.537 0.210 -0.206 -0.169 -0.071 -0.120 -0.023 -0.028 0.087 -0.218
-0.088 0.058 0.509 -0.150 -0.077 -0.060 -0.148 -0.215 0.105 0.108
-0.154 -0.128 0.533 0.058 -0.090 0.024

16 ECGT/R
0.141 0.197 -0.156 -0.104 0.319 0.434 -0.072 0.124 0.597 0.486
0.126 0.255 -0.775 -0.694 0.504 1.000 -0.500 0.742 0.278 -0.588
0.210 0.279 -0.017 -0.080 0.008 -0.130 -0.134 -0.168 0.081 -0.203
0.049 -0.004 0.302 -0.096 -0.048 -0.116 0.177 0.150 0.037 0.057
-0.055 -0.107 0.545 0.048 -0.026 0.026
17 ECGPIN
-0.302 -0.349 -0.060 -0.078 -0.062 -0.240 -0.271 -0.154 -0.413 -0.273
-0.434 0.179 0.667 0.283 -0.126 -0.500 1.000 -0.759 -0.211 0.198
-0.090 0.157 -0.063 0.205 0.114 0.151 0.362 0.411 0.132 0.226
-0.164 -0.084 -0.144 0.045 0.175 0.083 0.018 0.032 -0.082 -0.099
0.136 0.125 -0.043 0.169 0.133 0.172
18 ECGQIN
0.368 0.442 0.007 0.032 0.226 0.373 0.062 0.144 0.659 0.374
0.353 -0.005 -0.877 -0.520 0.198 0.742 -0.759 1.000 0.152 -0.455
0.052 0.073 0.025 -0.143 -0.049 -0.149 -0.267 -0.326 -0.041 -0.231
0.146 0.036 0.224 -0.090 -0.097 -0.063 0.158 0.147 0.055 0.070
-0.067 -0.105 0.298 -0.075 -0.061 -0.087
19 ECGRIN
-0.263 -0.246 -0.250 -0.190 0.206 0.375 0.355 0.065 -0.024 0.297
-0.055 0.138 -0.203 -0.291 0.633 0.278 -0.211 0.152 1.000 -0.149
0.056 -0.005 -0.257 -0.282 -0.265 -0.102 0.006 -0.039 0.025 -0.207
-0.144 0.162 0.212 -0.162 -0.240 -0.114 -0.369 -0.446 0.180 0.183
-0.264 -0.111 0.214 0.010 -0.197 -0.013
20 ECGSIN
-0.147 -0.209 0.291 0.285 -0.540 -0.405 0.407 -0.092 -0.671 -0.373
0.384 -0.450 0.559 0.793 -0.331 -0.588 0.198 -0.455 -0.149 1.000
0.262 -0.560 0.078 -0.065 -0.278 -0.020 -0.006 -0.135 -0.015 0.056
0.056 -0.006 -0.183 0.088 -0.213 -0.035 -0.299 -0.323 -0.036 -0.047
0.059 0.019 -0.722 -0.036 0.038 -0.013
21 ECGTIN
0.014 -0.041 0.073 0.154 -0.412 -0.176 0.170 -0.000 -0.392 -0.160
0.173 -0.288 0.058 -0.026 0.537 0.210 -0.090 0.052 0.056 0.262
1.000 -0.348 0.105 -0.113 -0.177 -0.131 -0.090 -0.278 0.156 -0.061
0.176 -0.123 0.022 0.107 -0.170 -0.120 -0.144 -0.244 -0.079 -0.085
0.114 -0.122 -0.130 0.102 0.134 0.091
22 OPINION
-0.181 -0.150 -0.278 -0.291 0.521 0.292 -0.454 -0.031 0.516 0.316
-0.295 0.502 -0.234 -0.497 0.210 0.279 0.137 0.073 -0.005 -0.580
-0.548 1.000 -0.174 0.220 0.190 0.025 0.197 0.442 -0.021 -0.015
-0.149 0.027 0.159 -0.124 0.176 0.047 0.278 0.325 -0.101 -0.089
0.062 0.016 0.595 0.026 0.067 0.031
23 PITCH
0.363 0.335 0.289 0.245 -0.238 -0.227 -0.139 -0.032 -0.119 -0.148
-0.020 -0.165 0.037 0.067 -0.206 -0.017 -0.063 0.028 -0.257 0.078
0.105 -0.174 1.000 0.357 0.475 0.274 -0.013 0.043 0.144 0.255
0.309 -0.190 -0.106 0.157 0.346 0.113 0.073 0.113 0.012 0.002
0.036 0.124 -0.076 0.061 0.022 0.057

24 ROLL

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.155 | 0.126 | 0.071 | 0.012 | -0.020 | -0.124 | -0.525 | 0.002 | -0.017 | -0.078 |
| -0.247 | 0.075 | 0.134 | 0.028 | -0.169 | -0.080 | 0.205 | -0.143 | -0.282 | -0.065 |
| -0.113 | 0.220 | 0.357 | 1.000 | 0.541 | 0.501 | 0.513 | 0.433 | 0.459 | 0.155 |
| 0.120 | -0.167 | -0.142 | 0.154 | 0.416 | 0.399 | 0.199 | 0.232 | -0.050 | -0.056 |
| 0.202 | 0.209 | 0.062 | 0.450 | 0.199 | 0.447 | | | | |

25 POWER

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.226 | 0.232 | -0.064 | -0.119 | 0.035 | -0.115 | -0.383 | -0.006 | 0.098 | -0.125 |
| -0.362 | 0.101 | -0.026 | -0.138 | -0.071 | 0.006 | 0.114 | -0.049 | -0.265 | -0.278 |
| -0.177 | 0.190 | 0.475 | 0.541 | 1.000 | 0.451 | 0.205 | 0.183 | 0.281 | 0.068 |
| 0.233 | -0.168 | -0.077 | 0.076 | 0.842 | 0.274 | 0.353 | 0.381 | -0.065 | -0.074 |
| 0.113 | 0.151 | 0.226 | 0.285 | 0.104 | 0.283 | | | | |

26 HEADING

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.043 | 0.034 | -0.054 | -0.093 | -0.078 | -0.093 | -0.123 | -0.055 | -0.060 | -0.101 |
| -0.168 | 0.052 | 0.088 | 0.062 | -0.120 | -0.130 | 0.151 | -0.149 | -0.102 | -0.020 |
| -0.131 | 0.025 | 0.274 | -.501 | 0.451 | 1.000 | 0.471 | 0.206 | 0.539 | 0.115 |
| 0.079 | -0.090 | -0.204 | 0.127 | 0.306 | 0.296 | 0.105 | 0.101 | 0.136 | 0.133 |
| -0.116 | 0.017 | 0.026 | 0.549 | -0.116 | 0.556 | | | | |

27 ROLLAC

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.109 | -0.124 | 0.029 | 0.019 | 0.109 | 0.102 | -0.194 | -0.058 | -0.095 | 0.002 |
| -0.214 | 0.162 | 0.242 | 0.049 | -0.023 | -0.134 | 0.362 | -0.267 | 0.006 | -0.006 |
| -0.090 | 0.197 | -0.013 | 0.513 | 0.205 | 0.471 | 1.000 | 0.662 | 0.777 | 0.231 |
| -0.063 | -0.209 | -0.182 | 0.242 | 0.135 | 0.163 | 0.087 | 0.059 | -0.115 | -0.124 |
| 0.263 | 0.227 | 0.053 | 0.813 | 0.297 | 0.809 | | | | |

28 PITCHAC

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.165 | -0.171 | -0.055 | -0.043 | 0.287 | 0.093 | -0.349 | -0.127 | 0.011 | 0.016 |
| -0.304 | 0.296 | 0.261 | -0.021 | -0.028 | -0.168 | 0.411 | -0.526 | -0.039 | -0.135 |
| -0.278 | 0.442 | 0.043 | 0.433 | 0.183 | 0.206 | 0.662 | 1.000 | 0.273 | 0.314 |
| -0.207 | -0.069 | -0.133 | 0.110 | 0.146 | 0.186 | 0.097 | 0.118 | -0.051 | -0.057 |
| 0.184 | 0.203 | 0.182 | 0.271 | 0.201 | 0.267 | | | | |

29 YAWACC

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.011 | -0.021 | 0.070 | 0.060 | -0.027 | 0.083 | -0.089 | -0.053 | -0.062 | 0.042 |
| -0.118 | 0.028 | 0.042 | -0.048 | 0.067 | 0.081 | 0.132 | -0.041 | 0.025 | -0.015 |
| 0.156 | -0.021 | 0.144 | 0.459 | 0.281 | 0.539 | 0.777 | 0.273 | 1.000 | 0.121 |
| 0.106 | -0.270 | -0.101 | 0.255 | 0.146 | 0.086 | 0.034 | -0.013 | -0.030 | -0.040 |
| 0.136 | 0.135 | 0.063 | 0.970 | 0.167 | 0.967 | | | | |

30 SPEEDER

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.040 | 0.022 | 0.145 | 0.120 | -0.104 | -0.097 | -0.191 | -0.021 | -0.187 | -0.108 |
| -0.144 | 0.078 | 0.286 | 0.069 | -0.218 | -0.203 | 0.226 | -0.231 | -0.207 | 0.056 |
| -0.061 | -0.015 | 0.255 | 0.155 | 0.068 | 0.113 | 0.231 | 0.314 | 0.121 | 1.000 |
| -0.252 | -0.528 | -0.643 | 0.592 | 0.104 | 0.055 | 0.041 | 0.074 | -0.130 | -0.145 |
| 0.260 | 0.257 | -0.087 | 0.222 | 0.257 | 0.211 | | | | |

31 S/PITCH

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.232 | 0.230 | 0.139 | 0.121 | -0.194 | -0.082 | -0.004 | 0.030 | -0.014 | -0.091 |
| 0.104 | -0.211 | -0.082 | 0.022 | -0.086 | 0.049 | -0.164 | 0.146 | -0.144 | 0.056 |
| 0.176 | -0.149 | 0.309 | 0.120 | 0.233 | 0.079 | -0.063 | -0.207 | 0.106 | -0.252 |
| 1.000 | -0.482 | -0.195 | 0.445 | 0.205 | 0.102 | 0.088 | 0.024 | 0.020 | 0.015 |
| 0.020 | -0.000 | -0.070 | 0.037 | 0.031 | 0.037 | | | | |

32 S/ROLL
-0.081 -0.067 -0.108 -0.098  0.118  0.021  0.141 -0.037  0.095  0.051
 0.065 -0.006 -0.105  0.026  0.058 -0.004 -0.084  0.036  0.162 -0.006
-0.125  0.027 -0.190 -0.167 -0.168 -0.090 -0.209 -0.069 -0.270 -0.528
-0.482  1.000  0.644 -0.892 -0.251 -0.057 -0.121 -0.080  0.140  0.155
-0.275 -0.145  0.009 -0.527 -0.288 -0.317
33 S/YAW
-0.096 -0.056 -0.099 -0.060  0.267  0.159  0.058 -0.052  0.247  0.196
 0.051  0.094 -0.298 -0.189  0.309  0.302 -0.144  0.224  0.212 -0.183
 0.022  0.159 -0.106 -0.142 -0.077 -0.204 -0.182 -0.133 -0.101 -0.643
-0.195  0.644  1.000 -0.785 -0.144 -0.074 -0.066 -0.046  0.056  0.064
-0.196 -0.191  0.261 -0.258 -0.197 -0.229
34 POWSET
 0.094  0.079  0.162  0.151 -0.199 -0.071 -0.089  0.025 -0.171 -0.115
-0.024 -0.059  0.182  0.047 -0.150 -0.096  0.095 -0.090 -0.162  0.088
 0.107 -0.124  0.157  0.154  0.076  0.127  0.242  0.110  0.255  0.592
 0.445 -0.892 -0.785  1.000  0.150  0.047  0.080  0.035 -0.088 -0.103
 0.234  0.204 -0.124  0.351  0.252  0.342
35 ALTERR
 0.141  0.138 -0.090 -0.134  0.027 -0.110 -0.318  0.002  0.062 -0.124
-0.321  0.120  0.022 -0.071 -0.077 -0.048  0.175 -0.097 -0.240 -0.213
-0.170  0.176  0.546  0.416  0.842  0.506  0.135  0.146  0.146  0.104
 0.205 -0.231 -0.144  0.150  1.000  0.219  0.385  0.381 -0.062 -0.084
 0.123  0.129  0.169  0.159  0.118  0.156
36 CXERR
 0.049  0.051 -0.023 -0.035 -0.005 -0.017 -0.036  0.122 -0.009 -0.059
-0.131  0.016  0.072  0.012 -0.060 -0.116  0.083 -0.063 -0.114 -0.035
-0.120  0.047  0.113  0.399  0.274  0.296  0.163  0.186  0.086  0.055
 0.102 -0.057 -0.074  0.047  0.219  1.000  0.076  0.089 -0.005  0.009
 0.027  0.049 -0.008  0.070  0.026  0.070
37 SACCLM
 0.147  0.155 -0.082 -0.094  0.088 -0.021 -0.275  0.139  0.333 -0.042
-0.077  0.210 -0.207 -0.135 -0.148  0.177  0.018  0.158 -0.369 -0.299
-0.144  0.278 -0.073  0.199  0.353  0.105  0.087  0.097  0.034  0.041
 0.068 -0.121 -0.066  0.080  0.385  0.076  1.000  0.831 -0.156 -0.079
 0.235  0.096  0.172  0.069  0.264  0.092
38 SACCLS
 0.145  0.209 -0.046 -0.082  0.079 -0.057 -0.348  0.105  0.384 -0.050
-0.084  0.209 -0.215 -0.094 -0.215  0.150  0.052  0.147 -0.446 -0.323
-0.244  0.325  0.113  0.232  0.381  0.101  0.039  0.118 -0.013  0.074
 0.024 -0.080 -0.046  0.035  0.381  0.089  0.831  1.000 -0.237 -0.188
 0.275  0.086  0.178  0.022  0.177  0.042
39 DWELLM
-0.035 -0.012 -0.067 -0.069  0.089  0.035  0.128 -0.048  0.045  0.066
-0.010  0.002 -0.069 -0.103  0.105  0.037 -0.082  0.055  0.160 -0.036
-0.079 -0.101  0.012 -0.050 -0.065  0.136 -0.115 -0.051 -0.030 -0.130
 0.020  0.140  0.056 -0.088 -0.082 -0.005 -0.158 -0.237  1.000  0.955
-0.712 -0.134  0.165 -0.065 -0.660 -0.070

40 DWELLS

-0.052 -0.033 -0.088 -0.085 0.122 0.061 0.137 -0.043 0.077 0.063
0.004 0.019 -0.085 -0.120 0.108 0.057 -0.099 0.070 0.183 -0.047
-0.085 -0.089 0.002 -0.056 -0.074 0.133 -0.124 -0.057 -0.040 -0.145
0.015 0.155 0.064 -0.103 -0.084 0.009 -0.079 -0.188 0.955 1.000
-0.731 -0.160 0.180 -0.075 -0.646 -0.085

41 FIXRATE

0.123 0.100 0.169 0.165 -0.132 -0.066 -0.193 0.113 -0.084 -0.109
-0.015 -0.013 0.117 0.120 -0.154 -0.055 0.136 -0.067 -0.264 0.059
0.114 0.062 0.036 0.202 0.113 -0.116 0.263 0.184 0.136 0.260
0.020 -0.275 -0.196 0.234 0.123 0.027 0.235 0.275 -0.712 -0.751
1.000 0.370 -0.247 0.180 0.963 0.166

42 BLINKR

0.104 0.096 0.079 0.048 -0.079 -0.059 -0.121 0.145 -0.069 -0.048
-0.126 0.064 0.143 0.009 -0.128 -0.107 0.125 -0.105 -0.111 0.019
-0.122 0.016 0.124 0.209 0.151 0.017 0.227 0.203 0.155 0.237
-0.000 -0.145 -0.191 0.204 0.129 0.049 0.096 0.086 -0.134 -0.160
0.370 1.000 -0.170 0.171 0.464 0.155

43 PUPILD

-0.099 -0.060 -0.394 -0.556 0.546 0.481 -0.349 -0.011 0.557 0.362
-0.343 0.477 -0.436 -0.729 0.533 0.545 -0.043 0.298 0.214 -0.722
-0.130 0.543 -0.076 0.062 0.226 0.028 0.033 0.182 0.063 -0.087
-0.070 0.009 0.261 -0.124 0.169 -0.008 0.172 0.178 0.165 0.180
-0.247 -0.170 1.000 0.056 -0.202 0.009

44 DISC1

-0.023 -0.033 0.042 0.028 -0.023 0.085 -0.119 -0.015 -0.061 0.033
-0.149 0.061 0.072 -0.049 0.058 0.048 0.169 -0.075 0.010 -0.036
0.102 0.026 0.061 0.450 0.285 0.549 0.813 0.271 0.970 0.222
0.037 -0.327 -0.238 0.351 0.159 0.070 0.069 0.022 -0.065 -0.075
0.180 0.171 0.056 1.000 0.211 0.995

45 DISC2

0.091 0.066 0.133 0.140 -0.092 -0.021 -0.175 0.132 -0.086 -0.081
-0.041 0.018 0.115 0.055 -0.090 -0.026 0.133 -0.061 -0.197 0.038
0.134 0.067 0.022 0.199 0.104 -0.116 0.297 0.201 0.167 0.257
0.031 -0.288 -0.197 0.252 0.118 0.026 0.264 0.177 -0.660 -0.646
0.963 0.464 -0.202 0.211 1.000 0.189

46 DISC3

-0.027 -0.036 0.056 0.038 -0.039 0.065 -0.105 -0.021 -0.069 0.021
-0.130 0.048 0.083 -0.008 0.024 0.026 0.172 -0.087 -0.013 -0.013
0.091 0.031 0.057 0.447 0.283 0.556 0.809 0.267 0.967 0.211
0.037 -0.317 -0.229 0.342 0.156 0.070 0.092 0.042 -0.070 -0.085
0.166 0.155 0.009 0.995 0.189 1.000

CORRELATION MATRIX DECELERATION SEGMENT

1 EMGARM
1.000 0.978 0.646 0.647 -0.221 -0.089 -0.127 0.157 0.064 -0.095
-0.068 -0.144 -0.158 -0.058 -0.301 0.064 -0.253 0.286 -0.276 -0.124
-0.048 -0.199 0.278 0.072 0.400 0.137 -0.186 -0.140 -0.208 0.129
0.094 0.015 -0.029 -0.027 0.311 0.004 0.151 0.165 -0.074 -0.044
0.155 0.015 -0.141 0.084 0.119 0.094

2 EMGARS
0.978 1.000 0.666 0.667 -0.176 -0.049 -0.134 0.166 0.101 -0.070
-0.069 -0.112 -0.181 -0.064 -0.322 0.081 -0.274 0.308 -0.265 -0.165
-0.103 -0.169 0.253 0.063 0.379 0.124 -0.164 -0.104 -0.218 0.110
0.097 0.023 -0.015 -0.031 0.286 0.021 0.148 0.171 -0.067 -0.044
0.144 0.017 -0.123 0.079 0.104 0.088

3 EMGALM
0.646 0.666 1.000 0.975 -0.213 -0.132 0.035 0.003 -0.098 -0.138
0.172 -0.206 -0.027 0.358 -0.414 -0.092 -0.139 0.117 -0.237 0.258
0.019 -0.320 0.138 -0.103 0.095 -0.003 -0.206 -0.202 -0.203 0.024
0.025 0.012 0.045 -0.058 0.052 -0.083 -0.063 -0.017 -0.041 -0.062
0.086 -0.106 -0.380 0.001 0.031 0.007

4 EMGALS
0.647 0.667 0.975 1.000 -0.199 -0.092 0.027 -0.002 -0.080 -0.114
0.180 -0.222 -0.066 0.275 -0.332 -0.029 -0.173 0.168 -0.197 0.220
0.085 -0.334 0.121 -0.146 0.090 -0.025 -0.240 -0.231 -0.223 -0.004
0.018 0.022 0.055 -0.053 0.046 -0.101 -0.057 -0.029 -0.032 -0.044
0.072 -0.132 -0.333 -0.026 0.029 -0.018

5 RESAMP
-0.221 -0.176 -0.213 -0.199 1.000 0.580 -0.249 -0.151 0.594 0.396
-0.080 0.392 -0.283 -0.372 0.274 0.272 -0.064 0.158 0.146 -0.532
-0.447 0.532 -0.282 0.000 -0.157 -0.054 0.285 0.374 -0.019 -0.238
0.059 0.071 0.172 -0.013 -0.140 -0.020 0.111 0.109 0.072 0.123
-0.142 -0.047 0.535 0.028 -0.107 0.022

6 RESAMS
-0.089 -0.049 -0.132 -0.092 0.580 1.000 -0.020 0.196 0.441 0.455
0.004 0.246 -0.360 -0.479 0.399 0.440 -0.254 0.334 0.382 -0.478
-0.171 0.293 -0.206 -0.076 -0.022 -0.004 0.177 0.194 -0.036 -0.157
0.086 0.003 0.142 -0.025 -0.068 -0.020 -0.044 -0.082 0.016 0.068
-0.099 -0.038 0.409 0.101 -0.031 0.096

7 RESPDM
-0.127 -0.134 0.035 0.027 -0.249 -0.020 1.000 0.491 -0.168 0.019
0.374 -0.221 -0.077 0.261 0.084 0.024 -0.249 0.107 0.309 0.403
0.258 -0.431 -0.128 -0.319 -0.157 -0.121 -0.332 -0.449 -0.116 -0.085
-0.042 0.077 0.093 -0.094 -0.138 0.044 -0.232 -0.281 0.154 0.111
-0.174 -0.113 -0.349 -0.141 -0.150 -0.147

8 RESPDS
0.157 0.166 0.003 -0.002 -0.151 0.196 0.491 1.000 0.082 0.030
-0.015 -0.002 -0.129 -0.131 0.033 0.153 -0.180 0.162 0.044 -0.127
-0.001 -0.029 0.088 0.015 0.155 0.053 -0.079 -0.080 -0.045 0.131
0.040 -0.062 -0.039 0.056 0.083 0.232 0.135 0.119 -0.062 -0.049
0.125 0.108 -0.039 0.038 0.116 0.049

9 ECGRAM
0.064 0.101 -0.098 -0.080 0.594 0.441 -0.168 0.082 1.000 0.504
0.241 0.214 -0.726 -0.531 0.120 0.608 -0.496 0.661 -0.017 -0.700
-0.385 0.524 -0.245 -0.104 -0.030 -0.108 -0.034 0.085 -0.159 -0.197
0.062 0.185 0.280 -0.126 -0.002 -0.033 0.340 0.406 0.017 0.066
-0.088 -0.073 0.571 -0.082 -0.117 -0.086
10 ECGRAS
-0.095 -0.070 -0.138 -0.114 0.396 0.455 0.019 0.030 0.504 1.000
0.135 0.247 -0.370 -0.389 0.308 0.488 -0.307 0.363 0.308 -0.380
-0.121 0.298 -0.197 -0.112 -0.108 -0.087 0.080 0.095 -0.065 -0.133
0.044 0.103 0.195 -0.106 -0.103 -0.003 0.033 -0.008 0.054 0.094
-0.127 -0.062 0.369 -0.014 -0.074 -0.021
11 ECGRDM
-0.068 -0.069 0.172 0.180 -0.080 0.004 0.374 -0.015 0.241 0.135
1.000 -0.121 -0.352 0.184 -0.170 0.242 -0.417 0.406 -0.030 0.261
0.162 -0.187 -0.117 -0.260 -0.151 -0.187 -0.274 -0.324 -0.170 -0.061
0.001 0.143 0.163 -0.149 -0.094 -0.110 0.029 0.040 0.019 0.029
-0.032 -0.128 -0.210 -0.178 -0.056 -0.170
12 ECGRDS
-0.144 -0.112 -0.206 -0.222 0.392 0.246 -0.221 -0.002 0.214 0.247
-0.121 1.000 -0.005 -0.159 0.155 0.105 0.195 -0.130 0.104 -0.325
-0.352 0.395 -0.125 0.158 -0.075 0.035 0.287 0.339 0.069 -0.022
0.062 -0.026 0.009 0.002 -0.096 0.097 0.186 0.167 -0.049 -0.019
0.036 0.050 0.329 0.095 0.050 0.105
13 ECGP/R
-0.158 -0.181 -0.027 -0.066 -0.283 -0.360 -0.077 -0.129 -0.726 -0.370
-0.352 -0.005 1.000 0.498 -0.238 -0.796 0.717 -0.875 -0.208 0.525
0.020 -0.210 0.190 0.280 -0.017 0.113 0.273 0.214 0.225 0.217
-0.026 -0.191 -0.332 0.158 -0.033 0.117 -0.221 -0.249 -0.052 -0.098
0.097 0.169 -0.410 0.106 0.112 0.112
14 ECGQ/R
-0.058 -0.064 0.358 0.275 -0.372 -0.479 0.261 -0.131 -0.531 -0.389
0.184 -0.159 0.498 1.000 -0.590 -0.678 0.300 -0.518 -0.296 0.793
-0.028 -0.405 0.069 0.003 -0.149 -0.022 -0.015 -0.111 0.020 0.056
-0.042 0.023 -0.085 -0.036 -0.084 -0.040 -0.144 -0.083 -0.073 -0.133
0.080 0.035 -0.734 -0.046 0.018 -0.030
15 ECGS/R
-0.301 -0.522 -0.414 -0.332 0.274 0.399 0.084 0.033 0.120 0.308
-0.170 0.155 -0.238 -0.590 1.000 0.488 -0.109 0.197 0.652 -0.317
0.348 0.182 -0.209 -0.204 -0.149 -0.040 -0.029 -0.032 0.072 -0.210
-0.075 -0.045 0.092 0.058 -0.121 -0.063 -0.153 -0.243 0.106 0.128
-0.182 -0.150 0.518 -0.025 -0.087 -0.041
16 ECGT/R
0.064 0.081 -0.092 -0.029 0.272 0.440 0.024 0.153 0.608 0.488
0.242 0.105 -0.796 -0.678 0.488 1.000 -0.586 0.771 0.313 -0.577
0.203 0.275 -0.144 -0.219 0.041 -0.060 -0.181 -0.134 -0.117 -0.145
0.040 0.105 0.293 -0.118 0.025 -0.055 0.214 0.168 0.044 0.111
-0.048 -0.151 0.541 -0.023 -0.019 -0.030
17 ECGPIN
-0.253 -0.274 -0.139 -0.173 -0.064 -0.254 -0.249 -0.180 -0.496 -0.307
-0.417 0.195 0.717 0.300 -0.109 -0.586 1.000 -0.798 -0.206 0.288
-0.009 0.104 0.127 0.332 -0.076 0.134 0.410 0.351 0.287 0.158
-0.022 -0.233 -0.286 0.214 -0.034 0.079 -0.086 -0.099 -0.108 -0.133
0.150 0.115 -0.114 0.157 0.154 0.167

```
18   ECGQIN
 0.286  0.308  0.117  0.168  0.158  0.334  0.107  0.162  0.661  0.363
 0.406 -0.130 -0.875 -0.518  0.197  0.771 -0.798  1.000  0.143 -0.466
 0.080  0.078 -0.121 -0.287  0.073 -0.104 -0.338 -0.292 -0.242 -0.164
 0.044  0.157  0.298 -0.146  0.066 -0.092  0.192  0.217  0.043  0.099
-0.061 -0.153  0.314 -0.096 -0.075 -0.102
19   ECGRIN
-0.276 -0.265 -0.237 -0.197  0.146  0.382  0.309  0.044 -0.017  0.308
-0.030  0.104 -0.208 -0.296  0.652  0.313 -0.206  0.143  1.000 -0.165
 0.081 -0.014 -0.287 -0.303 -0.200 -0.070 -0.005 -0.049 -0.071 -0.253
-0.037  0.063  0.162 -0.095 -0.193 -0.112 -0.370 -0.434  0.233  0.208
-0.309 -0.131  0.244 -0.016 -0.221 -0.043
20   ECGSIN
-0.124 -0.165  0.258  0.220 -0.532 -0.478  0.403 -0.127 -0.700 -0.380
 0.261 -0.325  0.525  0.793 -0.317 -0.577  0.288 -0.466 -0.165  1.000
 0.362 -0.591  0.130 -0.048 -0.136 -0.040 -0.099 -0.253  0.080  0.115
-0.060 -0.054 -0.136  0.015 -0.091 -0.047 -0.302 -0.318 -0.006 -0.062
 0.031 -0.032 -0.730 -0.052  0.020 -0.044
21   ECGTIN
-0.048 -0.103  0.019  0.085 -0.447 -0.171  0.258 -0.001 -0.385 -0.121
 0.162 -0.352  0.020 -0.028  0.348  0.203 -0.009  0.080  0.081  0.362
 1.000 -0.358  0.139 -0.140 -0.050 -0.000 -0.243 -0.341  0.157  0.066
-0.101 -0.123 -0.046  0.088 -0.026 -0.069 -0.133 -0.238 -0.066 -0.051
 0.113 -0.118 -0.143 -0.029  0.160 -0.022
22   OPINION
-0.199 -0.169 -0.320 -0.334  0.532  0.293 -0.431 -0.029  0.524  0.298
-0.187  0.395 -0.210 -0.405  0.182  0.275  0.104  0.078 -0.014 -0.591
-0.358  1.000 -0.221  0.187 -0.103  0.074  0.348  0.504  0.062 -0.123
-0.000  0.022  0.078  0.054 -0.062  0.109  0.265  0.328 -0.133 -0.095
 0.075  0.049  0.590  0.054  0.058  0.052
23   PITCH
 0.278  0.253  0.138  0.121 -0.282 -0.206 -0.128  0.088 -0.245 -0.197
-0.117 -0.125  0.190  0.069 -0.209 -0.144  0.127 -0.121 -0.287  0.130
 0.139 -0.221  1.000  0.423  0.534  0.281  0.069  0.071  0.299  0.722
 0.127 -0.371 -0.405  0.325  0.467  0.134  0.078  0.094  0.018  0.018
 0.108  0.147 -0.132  0.229  0.078  0.192
24   ROLL
 0.072  0.063 -0.103 -0.146  0.000 -0.076 -0.319  0.015 -0.104 -0.112
-0.260  0.158  0.280  0.003 -0.204 -0.219  0.332 -0.287 -0.303 -0.048
-0.140  0.187  0.423  1.000  0.424  0.425  0.531  0.424  0.389  0.448
 0.142 -0.285 -0.321  0.227  0.341  0.412  0.148  0.129 -0.098 -0.076
 0.219  0.213  0.048  0.476  0.214  0.473
25   POWER
 0.400  0.379  0.095  0.090 -0.157 -0.022 -0.157  0.155 -0.030 -0.108
-0.151 -0.075 -0.017 -0.149 -0.149  0.041 -0.076  0.073 -0.200 -0.136
-0.050 -0.103  0.534  0.424  1.000  0.391  0.095  0.049  0.143  0.473
 0.344 -0.111 -0.114 -0.049  0.779  0.222  0.162  0.138  0.032  0.058
 0.052  0.087  0.017  0.467  0.047  0.440
26   HEADING
 0.137  0.124 -0.003 -0.025 -0.054 -0.004 -0.121  0.053 -0.108 -0.087
-0.187  0.035  0.113 -0.022 -0.040 -0.060  0.134 -0.104 -0.070 -0.040
-0.000  0.074  0.281  0.425  0.391  1.000  0.450  0.164  0.521  0.253
 0.158 -0.343 -0.220  0.218  0.231  0.233  0.033 -0.029 -0.000  0.020
 0.047 -0.015  0.034  0.826  0.072  0.812
```

27 ROLLAC
-0.186 -0.164 -0.206 -0.240  0.285  0.177 -0.332 -0.079 -0.034  0.080
-0.274  0.287  0.273 -0.015 -0.029 -0.181  0.410 -0.338 -0.005 -0.099
-0.243  0.348  0.069  0.531  0.095  0.450  1.000  0.709  0.545  0.156
 0.207 -0.297 -0.207  0.231  0.041  0.191  0.065  0.013 -0.102 -0.092
 0.208  0.184  0.141  0.626  0.230  0.643
28 PITCHAC
-0.140 -0.104 -0.202 -0.231  0.374  0.194 -0.449 -0.080  0.085  0.095
-0.324  0.339  0.214 -0.111 -0.032 -0.134  0.351 -0.292 -0.049 -0.253
-0.391  0.504  0.071  0.424  0.049  0.164  0.709  1.000  0.248  0.117
 0.142 -0.205 -0.218  0.237  0.010  0.184  0.122  0.154 -0.088 -0.095
 0.146  0.203  0.249  0.237  0.129  0.245
29 YAWACC
-0.208 -0.218 -0.203 -0.223 -0.019 -0.036 -0.116 -0.045 -0.159 -0.065
-0.170  0.069  0.225  0.020  0.072 -0.117  0.287 -0.242 -0.071  0.080
 0.157  0.062  0.299  0.389  0.143  0.521  0.545  0.248  1.000  0.251
-0.040 -0.369 -0.340  0.389  0.051  0.186 -0.016 -0.047 -0.025 -0.021
 0.023 -0.016  0.091  0.467  0.042  0.445
30 SPEEDER
 0.129  0.110  0.024 -0.004 -0.238 -0.157 -0.085  0.131 -0.197 -0.133
-0.061 -0.022  0.217  0.056 -0.210 -0.145  0.158 -0.164 -0.253  0.115
 0.066 -0.123  0.722  0.448  0.473  0.253  0.156  0.117  0.251  1.000
 0.137 -0.436 -0.525  0.302  0.394  0.401  0.086  0.082 -0.079 -0.078
 0.193  0.198 -0.111  0.223  0.176  0.206
31 S/PITCH
 0.094  0.097  0.025  0.018  0.059  0.086 -0.042  0.040  0.062  0.044
 0.001  0.062 -0.026 -0.042 -0.075  0.040 -0.022  0.044 -0.037 -0.060
-0.101 -0.000  0.127  0.142  0.344  0.158  0.207  0.142 -0.040  0.137
 1.000  0.141  0.189 -0.267  0.308  0.148  0.093  0.084  0.004 -0.000
 0.039  0.081  0.005  0.358  0.032  0.361
32 S/ROLL
 0.015  0.023  0.012  0.022  0.071  0.003  0.077 -0.062  0.185  0.103
 0.143 -0.026 -0.191  0.023 -0.045  0.105 -0.233  0.157  0.063 -0.054
-0.123  0.022 -0.371 -0.285 -0.111 -0.343 -0.297 -0.205 -0.389 -0.436
 0.141  1.000  0.723 -0.835 -0.015 -0.166 -0.020  0.006  0.107  0.080
-0.148 -0.058 -0.015 -0.394 -0.162 -0.404
33 S/YAW
-0.029 -0.015  0.045  0.055  0.172  0.142  0.093 -0.039  0.280  0.195
 0.163  0.009 -0.332 -0.085  0.092  0.293 -0.286  0.298  0.162 -0.136
-0.046  0.078 -0.405 -0.321 -0.114 -0.220 -0.207 -0.218 -0.340 -0.525
 0.189  0.723  1.000 -0.804 -0.063 -0.298 -0.013  0.011  0.105  0.103
-0.159 -0.175  0.143 -0.010 -0.167 -0.030
34  POWSET
-0.027 -0.031 -0.058 -0.053 -0.013 -0.025 -0.094  0.056 -0.126 -0.106
-0.149  0.002  0.158 -0.036  0.058 -0.118  0.214 -0.146 -0.095  0.015
 0.088  0.054  0.325  0.227 -0.049  0.218  0.231  0.237  0.389  0.302
-0.267 -0.835 -0.804  1.000 -0.139  0.184  0.057  0.050 -0.114 -0.093
 0.129  0.063  0.029  0.068  0.132  0.088

35 ALTERR
0.311 0.286 0.052 0.046 -0.140 -0.068 -0.138 0.083 -0.002 -0.103
-0.094 -0.096 -0.033 -0.084 -0.121 0.025 -0.034 0.066 -0.193 -0.091
-0.026 -0.062 0.467 0.341 0.779 0.231 0.041 0.010 0.051 0.394
0.308 -0.015 -0.063 -0.139 1.000 0.132 0.200 0.165 -0.016 0.023
0.086 0.088 0.019 0.297 0.087 0.286
36 CXERR
0.004 0.021 -0.083 -0.101 -0.020 -0.020 0.044 0.232 -0.033 -0.003
-0.110 0.097 0.117 -0.040 -0.063 -0.055 0.079 -0.092 -0.112 -0.047
-0.069 0.109 0.134 0.412 0.222 0.233 0.191 0.184 0.186 0.401
0.148 -0.168 -0.298 0.184 0.132 1.000 0.110 0.098 -0.056 -0.056
0.106 0.088 0.025 0.159 0.097 0.167
37 SACCLM
0.151 0.148 -0.063 -0.057 0.111 -0.044 -0.232 0.135 0.340 0.033
0.029 0.186 -0.221 -0.144 -0.153 0.214 -0.086 0.192 -0.370 -0.302
-0.133 0.265 0.078 0.148 0.162 0.033 0.065 0.122 -0.016 0.086
0.093 -0.020 -0.013 0.057 0.200 0.110 1.000 0.809 -0.124 0.053
0.235 0.123 0.182 0.036 0.257 0.102
38 SACCLS
0.165 0.171 -0.017 -0.029 0.109 -0.082 -0.281 0.119 0.406 -0.008
0.040 0.167 -0.249 -0.083 -0.243 0.168 -0.099 0.217 -0.434 -0.318
-0.238 0.328 0.094 0.129 0.138 -0.029 0.013 0.154 -0.047 0.082
0.084 0.006 0.011 0.050 0.165 0.098 0.809 1.000 -0.207 -0.141
0.244 0.100 0.189 -0.036 0.075 -0.002
39 DWELLM
-0.074 -0.067 -0.041 -0.032 0.072 0.016 0.154 -0.062 0.017 0.054
0.019 -0.049 -0.052 -0.073 0.106 0.044 -0.108 0.043 0.233 -0.006
-0.066 -0.133 0.018 -0.098 0.032 -0.000 -0.102 -0.068 -0.023 -0.079
0.004 0.107 0.105 -0.114 -0.016 -0.056 -0.124 -0.207 1.000 0.930
-0.773 -0.104 0.122 -0.012 -0.745 -0.116
40 DWELLS
-0.044 -0.044 -0.062 -0.044 0.123 0.068 0.111 -0.049 0.066 0.094
0.029 -0.019 -0.098 -0.133 0.128 0.111 -0.133 0.099 0.208 -0.062
-0.051 -0.095 0.018 -0.076 0.058 0.020 -0.092 -0.095 -0.021 -0.078
-0.000 0.080 0.103 -0.093 0.023 -0.056 0.053 -0.141 0.930 1.000
-0.716 -0.103 0.165 0.015 -0.612 -0.068
41 FIXRATE
0.155 0.144 0.086 0.072 -0.142 -0.099 -0.174 0.125 -0.088 -0.127
-0.032 0.036 0.097 0.080 -0.182 -0.048 0.150 -0.061 -0.309 0.031
0.113 0.075 0.108 0.219 0.052 0.047 0.208 0.146 0.023 0.193
0.039 -0.148 -0.159 0.129 0.086 0.106 0.235 0.244 -0.773 -0.716
1.000 0.290 -0.208 0.095 0.937 0.194
42 BLINKR
0.015 0.017 -0.106 -0.132 -0.047 -0.038 -0.113 0.108 -0.073 -0.062
-0.128 0.050 0.169 0.035 -0.150 -0.151 0.115 -0.153 -0.131 -0.032
-0.118 0.049 0.147 0.213 0.087 -0.015 0.184 0.203 -0.016 0.198
0.081 -0.058 -0.175 0.063 0.088 0.088 0.123 0.100 -0.104 -0.103
0.290 1.000 -0.137 0.015 0.333 0.032
43 PUPILD
-0.141 -0.123 -0.380 -0.333 0.535 0.409 -0.349 -0.039 0.571 0.369
-0.210 0.329 -0.410 -0.734 0.518 0.541 -0.114 0.314 0.244 -0.730
-0.143 0.590 -0.132 0.048 0.017 0.034 0.141 0.249 0.091 -0.111
0.005 -0.015 0.143 0.029 0.019 0.025 0.182 0.189 0.122 0.165
-0.208 -0.137 1.000 0.071 -0.172 0.041

44 DISC1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.084 | 0.079 | 0.001 | -0.026 | 0.028 | 0.101 | -0.141 | 0.038 | -0.082 | -0.014 |
| -0.176 | 0.095 | 0.106 | -0.046 | -0.025 | -0.023 | 0.157 | -0.096 | -0.016 | -0.052 |
| -0.029 | 0.054 | 0.229 | 0.476 | 0.467 | 0.826 | 0.626 | 0.237 | 0.467 | 0.223 |
| 0.358 | -0.394 | -0.010 | 0.068 | 0.297 | 0.159 | 0.036 | -0.036 | -0.012 | 0.015 |
| 0.095 | 0.015 | 0.071 | 1.000 | 0.125 | 0.990 | | | | |

45 DISC2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.119 | 0.104 | 0.031 | 0.029 | -0.107 | -0.031 | -0.150 | 0.116 | -0.117 | -0.074 |
| -0.056 | 0.050 | 0.112 | 0.018 | -0.087 | -0.019 | 0.154 | -0.075 | -0.221 | 0.020 |
| 0.160 | 0.058 | 0.078 | 0.214 | 0.047 | 0.072 | 0.230 | 0.129 | 0.042 | 0.176 |
| 0.032 | -0.162 | -0.167 | 0.132 | 0.087 | 0.097 | 0.257 | 0.075 | -0.745 | -0.612 |
| 0.937 | 0.333 | -0.172 | 0.125 | 1.000 | 0.235 | | | | |

46 DISC3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.094 | 0.088 | 0.007 | -0.018 | 0.022 | 0.096 | -0.147 | 0.049 | -0.086 | -0.021 |
| -0.170 | 0.105 | 0.112 | -0.030 | -0.041 | -0.030 | 0.167 | -0.102 | -0.043 | -0.044 |
| -0.022 | 0.052 | 0.192 | 0.473 | 0.440 | 0.812 | 0.643 | 0.245 | 0.445 | 0.206 |
| 0.361 | -0.404 | -0.030 | 0.088 | 0.286 | 0.167 | 0.102 | -0.002 | -0.116 | -0.068 |
| 0.194 | 0.032 | 0.041 | 0.990 | 0.235 | 1.000 | | | | |

CORRELATION MATRIX HOVER SEGMENT

1 EMGARM
1.000 0.969 0.580 0.571 -0.287 -0.205 0.029 0.260 0.077 -0.137
-0.094 -0.147 -0.161 -0.169 -0.221 0.086 -0.206 0.280 -0.271 -0.175
-0.051 -0.182 0.378 0.219 0.402 0.270 -0.084 -0.115 -0.027 0.219
0.294 0.039 0.035 0.300 0.354 0.080 0.310 0.330 -0.119 -0.096
0.179 0.066 -0.039 0.072 0.142 0.069

2 EMGARS
0.969 1.000 0.598 0.592 -0.223 -0.146 0.034 0.258 0.114 -0.092
-0.070 -0.088 -0.182 -0.153 -0.239 0.099 -0.219 0.297 -0.240 -0.200
-0.117 -0.153 0.345 0.197 0.372 0.275 -0.051 -0.076 -0.046 0.187
0.265 0.026 0.050 0.258 0.326 0.094 0.284 0.293 -0.104 -0.079
0.152 0.064 -0.048 0.078 0.124 0.076

3 EMGALM
0.580 0.598 1.000 0.983 -0.239 -0.183 0.039 0.143 -0.166 -0.228
0.087 -0.126 0.073 0.397 -0.464 -0.247 -0.013 -0.020 -0.237 0.262
-0.116 -0.348 0.349 0.104 0.368 0.144 -0.008 -0.120 0.015 0.241
0.133 0.037 0.132 0.096 0.273 0.018 -0.055 -0.054 -0.002 -0.029
0.050 0.029 -0.386 0.084 0.025 0.085

4 EMGALS
0.571 0.592 0.983 1.000 -0.221 -0.169 0.035 0.121 -0.179 -0.208
0.096 -0.146 0.074 0.382 -0.422 -0.228 -0.006 -0.014 -0.211 0.277
-0.065 -0.355 0.363 0.089 0.391 0.137 -0.020 -0.132 0.012 0.255
0.125 0.047 0.130 0.080 0.294 0.024 -0.061 -0.075 0.000 -0.022
0.051 0.022 -0.378 0.074 0.034 0.074

5 RESAMP
-0.287 -0.223 -0.239 -0.221 1.000 0.662 -0.169 -0.255 0.557 0.513
0.094 0.295 -0.332 -0.315 0.310 0.333 -0.198 0.236 0.290 -0.422
-0.371 0.381 -0.374 -0.239 -0.277 -0.130 0.059 0.229 -0.232 -0.321
-0.210 -0.061 0.036 -0.229 -0.235 -0.090 -0.155 -0.183 0.197 0.234
-0.299 -0.153 0.418 -0.050 -0.239 -0.040

6 RESAMS
-0.205 -0.146 -0.183 -0.169 0.662 1.000 -0.053 0.063 0.391 0.375
0.017 0.222 -0.305 -0.328 0.302 0.317 -0.186 0.234 0.366 -0.375
-0.268 0.237 -0.242 -0.107 -0.113 -0.036 0.113 0.232 -0.100 -0.161
-0.112 -0.065 0.094 -0.147 -0.095 0.016 -0.142 -0.185 0.097 0.118
-0.146 -0.082 0.310 0.055 -0.091 0.061

7 RESPDM
0.029 0.034 0.039 0.035 -0.169 -0.053 1.000 0.586 -0.062 -0.030
0.134 -0.229 -0.125 0.086 0.024 0.037 -0.208 0.147 0.137 0.160
0.142 -0.265 -0.034 -0.139 -0.053 -0.052 -0.225 -0.295 -0.092 -0.032
-0.095 -0.030 0.069 -0.151 -0.043 0.062 -0.021 -0.108 0.050 0.037
-0.004 -0.041 -0.214 -0.009 0.012 -0.012

8 RESPDS
0.260 0.258 0.143 0.121 -0.255 0.063 0.586 1.000 0.055 -0.046
-0.050 -0.062 -0.110 -0.053 -0.080 0.050 -0.171 0.149 -0.004 -0.099
-0.080 -0.072 0.123 0.087 0.175 0.126 -0.104 -0.073 -0.024 0.118
0.120 0.077 0.020 0.126 0.165 0.136 0.215 0.167 -0.061 -0.058
0.093 0.040 -0.082 0.010 0.088 0.005

9 ECGRAM
0.077 0.114 -0.166 -0.179 0.557 0.391 -0.062 0.055 1.000 0.567
0.283 0.199 -0.732 -0.521 0.094 0.672 -0.514 0.675 -0.039 -0.673
-0.377 0.520 -0.219 -0.136 -0.134 -0.053 -0.173 0.076 -0.263 -0.259
0.046 -0.028 0.038 0.059 -0.086 -0.019 0.192 0.218 0.054 0.118
-0.189 -0.129 0.604 -0.034 -0.165 -0.023
10 ECGRAS
-0.137 -0.092 -0.228 -0.208 0.513 0.375 -0.030 -0.046 0.567 1.000
0.183 0.210 -0.437 -0.410 0.300 0.527 -0.341 0.432 0.286 -0.357
-0.152 0.292 -0.291 -0.227 -0.212 -0.125 -0.051 0.084 -0.195 -0.254
-0.137 -0.085 0.065 -0.180 -0.196 -0.038 -0.092 -0.164 0.045 0.097
-0.143 -0.047 0.382 -0.011 -0.057 -0.007
11 ECGRDM
-0.094 -0.070 0.087 0.096 0.094 0.017 0.134 -0.050 0.283 0.183
1.000 -0.196 -0.434 0.168 -0.170 0.230 -0.464 0.438 -0.029 0.292
0.153 -0.190 -0.163 -0.368 -0.186 -0.226 -0.361 -0.335 -0.233 -0.173
-0.148 0.013 0.041 -0.204 -0.155 -0.144 -0.078 -0.146 0.068 0.090
-0.124 -0.072 -0.151 -0.141 -0.083 -0.158
12 ECGRDS
-0.147 -0.088 -0.126 -0.146 0.295 0.222 -0.229 -0.062 0.199 0.210
-0.196 1.000 0.011 -0.088 0.037 0.052 0.181 -0.142 0.071 -0.371
-0.459 0.409 -0.182 0.097 -0.111 0.036 0.304 0.394 -0.037 -0.125
0.024 -0.063 -0.000 0.013 -0.061 0.052 0.130 0.163 -0.092 -0.056
0.057 0.112 0.282 0.066 0.070 0.060
13 ECGP/R
-0.161 -0.182 0.073 0.074 -0.332 -0.305 -0.125 -0.110 -0.732 -0.437
-0.434 0.011 1.000 0.455 -0.257 -0.811 0.745 -0.885 -0.237 0.451
0.022 -0.178 0.173 0.312 0.126 0.080 0.407 0.268 0.283 0.254
0.019 0.066 -0.128 0.051 0.087 0.097 -0.134 -0.082 -0.085 -0.146
0.216 0.195 -0.432 0.030 0.167 0.015
14 ECGQ/R
-0.169 -0.153 0.397 0.382 -0.315 -0.328 0.086 -0.053 -0.521 -0.410
0.168 -0.088 0.455 1.000 -0.538 -0.680 0.282 -0.499 -0.226 0.744
-0.039 -0.389 0.107 0.007 0.061 0.004 0.076 -0.094 0.090 0.143
-0.075 0.063 0.035 -0.119 0.025 -0.029 -0.210 -0.183 -0.040 -0.098
0.094 0.036 -0.718 -0.017 0.048 -0.025
15 ECGS/R
-0.221 -0.239 -0.464 -0.422 0.310 0.302 0.024 -0.080 0.094 0.300
-0.170 0.037 -0.257 -0.538 1.000 0.456 -0.161 0.220 0.651 -0.228
0.381 0.135 -0.340 -0.282 -0.272 -0.186 -0.159 -0.143 -0.076 -0.275
-0.221 -0.108 -0.014 -0.198 -0.213 -0.133 -0.091 -0.156 0.112 0.135
-0.208 -0.135 0.443 -0.043 -0.142 -0.031
16 ECGT/R
0.086 0.099 -0.247 -0.228 0.333 0.317 0.037 0.050 0.672 0.527
0.230 0.052 -0.811 -0.680 0.456 1.000 -0.586 0.792 0.266 -0.563
0.116 0.338 -0.232 -0.264 -0.170 -0.061 -0.283 -0.130 -0.211 -0.276
-0.014 -0.130 0.106 -0.010 -0.128 -0.079 0.194 0.123 0.023 0.103
-0.114 -0.186 0.610 0.030 -0.052 0.038
17 ECGPIN
-0.206 -0.219 -0.013 -0.006 -0.198 -0.186 -0.208 -0.171 -0.514 -0.341
-0.464 0.181 0.743 0.282 -0.161 -0.586 1.000 -0.773 -0.220 0.249
0.015 0.057 0.130 0.337 0.077 0.074 0.454 0.369 0.319 0.203
0.073 0.030 -0.129 0.114 0.053 0.108 -0.071 -0.012 -0.101 -0.135
0.209 0.179 -0.154 0.065 0.174 0.053

18 ECGQIN

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.280 | 0.297 | -0.020 | -0.014 | 0.236 | 0.234 | 0.147 | 0.149 | 0.675 | 0.432 |
| 0.438 | -0.142 | -0.885 | -0.499 | 0.220 | 0.792 | -0.773 | 1.000 | 0.161 | -0.402 |
| 0.053 | 0.099 | -0.127 | -0.286 | -0.077 | -0.054 | -0.421 | -0.313 | -0.263 | -0.209 |
| -0.001 | -0.045 | 0.145 | -0.038 | -0.044 | -0.077 | 0.163 | 0.090 | 0.050 | 0.113 |
| -0.144 | -0.142 | 0.361 | -0.023 | -0.090 | -0.013 | | | | |

19 ECGRIN

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.271 | -0.240 | -0.237 | -0.211 | 0.290 | 0.366 | 0.137 | -0.004 | -0.039 | 0.286 |
| -0.029 | 0.071 | -0.237 | -0.226 | 0.651 | 0.266 | -0.220 | 0.161 | 1.000 | -0.079 |
| 0.068 | -0.025 | -0.306 | -0.338 | -0.226 | -0.149 | -0.076 | -0.081 | -0.161 | -0.239 |
| -0.331 | -0.075 | 0.096 | -0.397 | -0.232 | -0.134 | -0.306 | -0.393 | 0.194 | 0.195 |
| -0.297 | -0.110 | 0.159 | -0.047 | -0.216 | -0.034 | | | | |

20 ECGSIN

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.175 | -0.200 | 0.262 | 0.277 | -0.422 | -0.375 | 0.160 | -0.099 | -0.673 | -0.357 |
| 0.292 | -0.371 | 0.451 | 0.744 | -0.228 | -0.563 | 0.249 | -0.402 | -0.079 | 1.000 |
| 0.431 | -0.617 | 0.103 | -0.078 | 0.002 | -0.123 | -0.038 | -0.300 | 0.155 | 0.165 |
| -0.136 | 0.055 | 0.020 | -0.195 | -0.032 | -0.072 | -0.295 | -0.370 | 0.031 | -0.028 |
| 0.060 | 0.033 | -0.726 | -0.047 | 0.062 | -0.052 | | | | |

21 ECGTIN

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.051 | -0.117 | -0.116 | -0.065 | -0.371 | -0.268 | 0.142 | -0.080 | -0.377 | -0.152 |
| 0.153 | -0.459 | 0.022 | -0.039 | 0.381 | 0.116 | 0.015 | 0.053 | 0.068 | 0.431 |
| 1.000 | -0.341 | 0.014 | -0.128 | -0.104 | -0.171 | -0.248 | -0.440 | 0.174 | 0.014 |
| -0.058 | -0.040 | -0.034 | -0.037 | -0.088 | -0.096 | -0.054 | -0.162 | -0.064 | -0.070 |
| 0.128 | -0.068 | -0.134 | -0.024 | 0.160 | -0.028 | | | | |

22 OPINION

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.182 | -0.153 | -0.348 | -0.355 | 0.381 | 0.237 | -0.265 | -0.072 | 0.520 | 0.292 |
| -0.190 | 0.409 | -0.178 | -0.389 | 0.135 | 0.338 | 0.057 | 0.099 | -0.025 | -0.617 |
| -0.341 | 1.000 | -0.242 | 0.118 | -0.187 | 0.153 | 0.257 | 0.525 | -0.024 | -0.214 |
| 0.096 | -0.017 | -0.128 | 0.205 | -0.138 | 0.090 | 0.172 | 0.271 | -0.126 | -0.080 |
| 0.029 | -0.010 | 0.592 | 0.001 | 0.022 | -0.006 | | | | |

23 PITCH

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.378 | 0.345 | 0.349 | 0.363 | -0.374 | -0.242 | -0.034 | 0.123 | -0.219 | -0.291 |
| -0.163 | -0.182 | 0.173 | 0.107 | -0.340 | -0.232 | 0.130 | -0.127 | -0.306 | 0.103 |
| 0.014 | -0.242 | 1.000 | 0.501 | 0.668 | 0.245 | 0.068 | 0.077 | 0.264 | 0.726 |
| 0.447 | 0.118 | 0.136 | 0.376 | 0.526 | 0.206 | 0.109 | 0.149 | 0.066 | 0.042 |
| 0.080 | 0.154 | -0.149 | 0.162 | 0.030 | 0.170 | | | | |

24 ROLL

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.219 | 0.197 | 0.104 | 0.089 | -0.239 | -0.107 | -0.139 | 0.087 | -0.136 | -0.227 |
| -0.368 | 0.097 | 0.312 | 0.007 | -0.282 | -0.264 | 0.337 | -0.286 | -0.338 | -0.078 |
| -0.128 | 0.118 | 0.501 | 1.000 | 0.511 | 0.444 | 0.530 | 0.465 | 0.484 | 0.485 |
| 0.371 | 0.049 | 0.049 | 0.375 | 0.415 | 0.351 | 0.182 | 0.201 | -0.131 | -0.136 |
| 0.205 | 0.143 | 0.031 | 0.311 | 0.180 | 0.309 | | | | |

25 POWER

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.402 | 0.372 | 0.368 | 0.391 | -0.277 | -0.113 | -0.053 | 0.175 | -0.134 | -0.212 |
| -0.186 | -0.111 | 0.126 | 0.061 | -0.272 | -0.170 | 0.077 | -0.077 | -0.226 | 0.002 |
| -0.104 | -0.187 | 0.688 | 0.511 | 1.000 | 0.323 | 0.177 | 0.153 | 0.288 | 0.748 |
| 0.541 | 0.087 | 0.196 | 0.419 | 0.674 | 0.292 | 0.162 | 0.184 | 0.013 | -0.006 |
| 0.102 | 0.127 | -0.098 | 0.301 | 0.060 | 0.303 | | | | |

26 HEADING

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.270 | 0.275 | 0.144 | 0.137 | -0.130 | -0.036 | -0.052 | 0.126 | -0.053 | -0.125 |
| -0.226 | 0.036 | 0.080 | 0.004 | -0.186 | -0.061 | 0.074 | -0.054 | -0.149 | -0.123 |
| -0.171 | 0.153 | 0.245 | 0.444 | 0.323 | 1.000 | 0.360 | 0.274 | 0.448 | 0.264 |
| 0.239 | 0.160 | -0.077 | 0.278 | 0.247 | 0.244 | 0.239 | 0.177 | -0.152 | -0.121 |
| 0.208 | 0.045 | -0.024 | 0.105 | 0.219 | 0.101 | | | | |

27 ROLLAC
-0.084 -0.051 -0.008 -0.020 0.059 0.113 -0.225 -0.104 -0.173 -0.051
-0.361 0.304 0.407 0.076 -0.159 -0.283 0.454 -0.421 -0.076 -0.038
-0.248 0.257 0.068 0.530 0.177 0.360 1.000 0.738 0.526 0.194
0.155 -0.116 -0.011 0.179 0.129 0.278 -0.012 -0.006 -0.157 -0.151
0.263 0.201 -0.018 0.341 0.269 0.326
28 PITCHAC
-0.115 -0.076 -0.120 -0.132 0.229 0.232 -0.295 -0.073 0.076 0.084
-0.335 0.394 0.268 -0.094 -0.143 -0.130 0.369 -0.313 -0.081 -0.300
-0.440 0.525 0.077 0.465 0.153 0.274 0.736 1.000 0.238 0.144
0.207 0.027 -0.090 0.249 0.104 0.250 0.062 0.133 -0.107 -0.069
0.172 0.199 0.213 0.164 0.160 0.151
29 YAWACC
-0.027 -0.046 0.015 0.012 -0.232 -0.100 -0.092 -0.024 -0.263 -0.195
-0.233 -0.037 0.283 0.090 -0.076 -0.211 0.319 -0.263 -0.161 0.155
0.174 -0.024 0.264 0.484 0.288 0.448 0.526 0.238 1.000 0.290
0.230 0.072 -0.137 0.277 0.216 0.232 0.039 0.017 -0.063 -0.071
0.096 0.043 -0.056 0.217 0.096 0.224
30 SPEEDER
0.219 0.187 0.241 0.255 -0.321 -0.161 -0.032 0.118 -0.259 -0.254
-0.173 -0.125 0.254 0.143 -0.275 -0.276 0.203 -0.209 -0.239 0.165
0.014 -0.214 0.726 0.485 0.748 0.264 0.194 0.144 0.290 1.000
0.586 0.252 0.133 0.398 0.694 0.395 0.067 0.113 -0.026 -0.052
0.170 0.166 -0.183 0.151 0.128 0.151
31 S/PITCH
0.294 0.265 0.133 0.125 -0.210 -0.112 -0.095 0.120 0.046 -0.137
-0.148 0.024 0.019 -0.075 -0.221 -0.014 0.073 -0.001 -0.331 -0.136
-0.058 0.096 0.447 0.371 0.541 0.239 0.155 0.207 0.230 0.586
1.000 0.321 -0.110 0.751 0.606 0.307 0.316 0.389 -0.157 -0.146
0.279 0.153 0.049 -0.015 0.218 -0.018
32 S/ROLL
0.039 0.026 0.037 0.047 -0.061 -0.065 -0.030 0.077 -0.028 -0.085
0.013 -0.063 0.066 0.063 -0.108 -0.130 0.030 -0.045 -0.075 0.055
-0.040 -0.017 0.118 0.049 0.087 0.160 -0.116 0.027 0.072 0.252
0.321 1.000 -0.550 0.152 0.103 0.075 0.072 0.105 -0.021 -0.025
0.016 0.057 -0.086 -0.832 -0.006 -0.830
33 S/YAW
0.035 0.050 0.132 0.130 0.036 0.094 0.069 0.020 0.038 0.065
0.041 -0.000 -0.128 0.035 -0.014 0.106 -0.129 0.145 0.096 0.020
-0.034 -0.128 0.136 0.049 0.196 -0.077 -0.011 -0.090 -0.137 0.133
-0.110 -0.550 1.000 -0.340 0.122 -0.025 -0.116 -0.171 0.125 0.123
-0.075 -0.041 0.004 0.740 -0.050 0.744
34 POWSET
0.300 0.258 0.096 0.080 -0.229 -0.147 -0.151 0.126 0.059 -0.180
-0.204 0.013 0.051 -0.119 -0.198 -0.010 0.114 -0.038 -0.397 -0.195
-0.037 0.205 0.376 0.375 0.419 0.278 0.179 0.249 0.277 0.348
0.751 0.152 -0.340 1.000 0.435 0.171 0.363 0.458 -0.246 -0.241
0.315 0.118 0.097 0.036 0.244 0.030
35 ALTERR
0.354 0.326 0.273 0.294 -0.235 -0.095 -0.043 0.165 -0.086 -0.196
-0.155 -0.061 0.087 0.025 -0.213 -0.128 0.053 -0.044 -0.232 -0.032
-0.088 -0.138 0.526 0.415 0.874 0.247 0.129 0.104 0.216 0.694
0.606 0.103 0.122 0.435 1.000 0.384 0.221 0.270 -0.042 -0.051
0.144 0.129 -0.075 0.244 0.089 0.244

36 CXERR
0.080 0.094 0.018 0.024 -0.090 0.016 0.062 0.136 -0.019 -0.038
-0.144 0.052 0.097 -0.029 -0.133 -0.079 0.108 -0.077 -0.134 -0.072
-0.096 0.090 0.206 0.351 0.292 0.244 0.278 0.250 0.232 0.395
0.307 0.075 -0.025 0.171 0.384 1.000 0.117 0.132 -0.094 -0.084
0.188 0.096 0.000 0.197 0.170 0.188

37 SACCLM
0.310 0.284 -0.055 -0.061 -0.155 -0.142 -0.021 0.215 0.192 -0.092
-0.078 0.130 -0.134 -0.210 -0.091 0.194 -0.071 0.163 -0.306 -0.295
-0.054 0.172 0.109 0.182 0.162 0.239 -0.012 0.062 0.039 0.087
0.316 0.072 -0.116 0.363 0.221 0.117 1.000 0.805 -0.129 0.033
0.216 0.071 0.212 -0.000 0.261 -0.014

38 SACCLS
0.330 0.293 -0.054 -0.075 -0.183 -0.185 -0.108 0.167 0.218 -0.164
-0.146 0.163 -0.082 -0.183 -0.156 0.123 -0.012 0.090 -0.393 -0.370
-0.162 0.271 0.149 0.201 0.184 0.177 -0.006 0.133 0.017 0.113
0.389 0.105 -0.171 0.458 0.270 0.132 0.805 1.000 -0.258 -0.184
0.298 0.079 0.214 -0.033 0.166 -0.045

39 DWELLM
-0.119 -0.104 -0.002 0.000 0.197 0.097 0.050 -0.061 0.054 0.045
0.068 -0.092 -0.085 -0.040 0.112 0.023 -0.101 0.050 0.194 0.031
-0.064 -0.126 0.066 -0.131 0.013 -0.152 -0.157 -0.107 -0.063 -0.026
-0.157 -0.021 0.125 -0.246 -0.042 -0.094 -0.129 -0.258 1.000 0.933
-0.745 -0.075 0.132 -0.016 -0.739 0.007

40 DWELLS
-0.096 -0.079 -0.029 -0.022 0.234 0.118 0.037 -0.058 0.118 0.097
0.090 -0.056 -0.146 -0.098 0.135 0.103 -0.135 0.113 0.195 -0.028
-0.070 -0.080 0.042 -0.136 -0.006 -0.121 -0.151 -0.089 -0.071 -0.052
-0.146 -0.025 0.123 -0.241 -0.051 -0.084 0.033 -0.184 0.933 1.000
-0.708 -0.072 0.192 -0.015 -0.621 0.006

41 FIXRATE
0.179 0.152 0.050 0.051 -0.299 -0.146 -0.004 0.093 -0.189 -0.143
-0.124 0.057 0.216 0.094 -0.208 -0.114 0.209 -0.144 -0.297 0.060
0.128 0.029 0.080 0.205 0.102 0.208 0.263 0.172 0.096 0.170
0.279 0.016 -0.075 0.315 0.144 0.188 0.216 0.298 -0.745 -0.708
1.000 0.272 -0.238 0.085 0.942 0.029

42 BLINKR
0.066 0.064 0.029 0.022 -0.153 -0.082 -0.041 0.040 -0.129 -0.047
-0.072 0.112 0.195 0.036 -0.135 -0.186 0.179 -0.142 -0.110 0.033
-0.068 -0.010 0.154 0.143 0.127 0.045 0.201 0.199 0.043 0.166
0.153 0.057 -0.041 0.118 0.129 0.096 0.071 0.079 -0.075 -0.072
0.272 1.000 -0.204 0.011 0.318 -0.018

43 PUPILD
-0.039 -0.048 -0.386 -0.378 0.418 0.310 -0.214 -0.082 0.604 0.382
-0.151 0.282 -0.432 -0.718 0.443 0.610 -0.154 0.361 0.159 -0.726
-0.134 0.592 -0.149 0.031 -0.098 -0.024 -0.018 0.213 -0.056 -0.183
0.049 -0.086 0.004 0.097 -0.075 0.000 0.212 0.214 0.132 0.192
-0.238 -0.204 1.000 0.051 -0.200 0.069

44 DISC1

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.072 | 0.078 | 0.084 | 0.074 | -0.050 | 0.055 | -0.009 | 0.010 | -0.034 | -0.011 |
| -0.141 | 0.066 | 0.030 | -0.017 | -0.043 | 0.030 | 0.065 | -0.023 | -0.047 | -0.047 |
| -0.024 | 0.001 | 0.162 | 0.311 | 0.301 | 0.105 | 0.341 | 0.164 | 0.217 | 0.151 |
| -0.015 | -0.832 | 0.740 | 0.036 | 0.244 | 0.197 | -0.000 | -0.033 | -0.016 | -0.015 |
| 0.085 | 0.011 | 0.051 | 1.000 | 0.094 | 0.998 | | | | |

45 DISC2

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.142 | 0.124 | 0.025 | 0.034 | -0.239 | -0.091 | 0.012 | 0.088 | -0.165 | -0.057 |
| -0.083 | 0.070 | 0.167 | 0.048 | -0.142 | -0.052 | 0.174 | -0.090 | -0.216 | 0.062 |
| 0.160 | 0.022 | 0.030 | 0.180 | 0.060 | 0.219 | 0.269 | 0.160 | 0.096 | 0.128 |
| 0.218 | -0.006 | -0.050 | 0.244 | 0.089 | 0.170 | 0.261 | 0.166 | -0.759 | -0.621 |
| 0.942 | 0.318 | -0.200 | 0.094 | 1.000 | 0.041 | | | | |

46 DISC3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.069 | 0.076 | 0.085 | 0.074 | -0.040 | 0.061 | -0.012 | 0.005 | -0.023 | -0.007 |
| -0.138 | 0.060 | 0.015 | -0.025 | -0.031 | 0.038 | 0.053 | -0.013 | -0.034 | -0.052 |
| -0.028 | -0.006 | 0.170 | 0.309 | 0.303 | 0.101 | 0.326 | 0.151 | 0.224 | 0.151 |
| -0.018 | -0.830 | 0.744 | 0.030 | 0.244 | 0.188 | -0.014 | -0.045 | 0.007 | 0.006 |
| 0.029 | -0.018 | 0.069 | 0.998 | 0.041 | 1.000 | | | | |

# APPENDIX C

## GRAND MEANS

Table C-1. Means of Main Effects for Physiological Measures in Approach Segment

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| EMGARM | 15.485 | 17.653 | 16.360 | 16.189 | 17.158 | 15.972 | 17.555 | 16.180 |
| EMGARS | 10.770 | 11.974 | 11.222 | 11.058 | 11.836 | 10.885 | 12.068 | 11.162 |
| EMGALR | 10.264 | 11.712 | 10.266 | 10.673 | 12.024 | 11.006 | 11.817 | 10.141 |
| EMGALS | 7.817 | 8.887 | 7.841 | 8.122 | 9.094 | 8.354 | 8.788 | 7.914 |
| RESAMP | 141.452 | 150.685 | 148.253 | 143.995 | 145.959 | 145.673 | 144.435 | 148.098 |
| RESAMS | 23.926 | 27.449 | 23.127 | 26.555 | 27.382 | 26.016 | 24.261 | 26.787 |
| RESPDM | 2.637 | 2.507 | 2.607 | 2.588 | 2.521 | 2.607 | 5.533 | 2.576 |
| RESPDS | 0.274 | 0.334 | 0.298 | 0.332 | 0.283 | 0.322 | 0.287 | 0.303 |
| ECGRAM | 242.986 | 245.217 | 246.037 | 243.311 | 242.957 | 243.836 | 244.054 | 244.416 |
| ECGRAS | 19.081 | 21.357 | 19.649 | 20.696 | 20.314 | 19.658 | 22.021 | 18.980 |
| ECGRDM | 0.716 | 0.699 | 0.720 | 0.705 | 0.697 | 0.710 | 0.703 | 0.710 |
| ECGRDS | 0.084 | 0.087 | 0.082 | 0.087 | 0.088 | 0.082 | 0.088 | 0.087 |
| ECGP/R | 0.010 | 0.017 | 0.013 | 0.015 | 0.014 | 0.013 | 0.014 | 0.014 |
| ECGQ/R | -0.146 | -0.149 | -0.148 | -0.147 | -0.147 | -0.146 | -0.147 | -0.148 |
| ECGS/R | -0.173 | -0.179 | -0.174 | -0.176 | -0.178 | -0.176 | -0.176 | -0.176 |
| ECGT/R | 0.151 | 0.145 | 0.145 | 0.147 | 0.151 | 0.149 | 0.149 | 0.146 |
| ECGPIN | 0.048 | 0.061 | 0.045 | 0.057 | 0.061 | 0.052 | 0.053 | 0.058 |
| ECGQIN | 0.184 | 0.179 | 0.186 | 0.179 | 0.181 | 0.181 | 0.179 | 0.184 |
| ECGRIN | 0.039 | 0.038 | 0.039 | 0.039 | 0.038 | 0.039 | 0.039 | 0.039 |
| ECGSIN | 0.147 | 0.144 | 0.148 | 0.145 | 0.144 | 0.146 | 0.146 | 0.145 |
| ECGTIN | 0.129 | 0.126 | 0.127 | 0.128 | 0.127 | 0.128 | 0.125 | 0.128 |

Table C-2. Means of Main Effects for Physiological Measures in Deceleration Segment

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| EMGARM | 16.895 | 20.014 | 17.725 | 18.281 | 19.359 | 17.688 | 19.093 | 18.583 |
| EMGARS | 11.443 | 13.619 | 11.962 | 12.469 | 13.162 | 12.020 | 12.945 | 12.627 |
| EMGALR | 14.061 | 15.997 | 14.520 | 15.122 | 15.444 | 15.089 | 15.777 | 14.220 |
| EMGALS | 10.939 | 12.251 | 11.411 | 11.683 | 11.691 | 11.678 | 11.984 | 11.123 |
| RESAMP | 138.475 | 143.563 | 141.639 | 138.609 | 142.809 | 139.550 | 140.004 | 143.504 |
| RESAMS | 23.355 | 26.580 | 22.833 | 25.342 | 26.729 | 25.578 | 23.788 | 25.547 |
| RESPDM | 2.551 | 2.420 | 2.521 | 2.499 | 2.436 | 2.507 | 2.461 | 2.487 |
| RESPDS | 0.241 | 0.291 | 0.242 | 0.276 | 0.280 | 0.278 | 0.262 | 0.258 |
| ECGRAM | 243.579 | 246.334 | 247.039 | 244.822 | 243.010 | 244.805 | 245.562 | 244.504 |
| ECGRAS | 19.897 | 21.961 | 18.957 | 22.164 | 21.666 | 20.581 | 20.507 | 21.699 |
| ECGRDM | 0.702 | 0.691 | 0.707 | 0.694 | 0.688 | 0.698 | 0.693 | 0.698 |
| ECGRDS | 0.088 | 0.093 | 0.085 | 0.094 | 0.093 | 0.087 | 0.091 | 0.093 |
| ECGP/R | 0.011 | 0.015 | 0.012 | 0.014 | 0.014 | 0.013 | 0.014 | 0.012 |
| ECGQ/R | -0.146 | -0.151 | -0.148 | -0.147 | -0.151 | -0.148 | -0.149 | -0.150 |
| ECGS/R | -0.173 | -0.181 | -0.175 | -0.176 | -0.179 | -0.176 | -0.178 | -0.176 |
| ECGT/R | 0.152 | 0.147 | 0.147 | 0.149 | 0.152 | 0.148 | 0.151 | 0.150 |
| ECGPIN | 0.053 | 0.062 | 0.051 | 0.060 | 0.062 | 0.057 | 0.057 | 0.059 |
| ECGQIN | 0.182 | 0.182 | 0.183 | 0.180 | 0.182 | 0.183 | 0.181 | 0.181 |
| ECGRIN | 0.039 | 0.038 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 |
| ECGSIN | 0.146 | 0.142 | 0.145 | 0.144 | 0.143 | 0.144 | 0.144 | 0.143 |
| ECGTIN | 0.128 | 0.125 | 0.126 | 0.126 | 0.126 | 0.127 | 0.125 | 0.127 |

Table C-3. Means of Main Effects for Physiological Measures in Hover Segment

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| ENGARM | 17.018 | 20.071 | 17.833 | 18.285 | 19.516 | 17.939 | 19.175 | 18.519 |
| EMGARS | 11.519 | 13.920 | 12.144 | 12.463 | 13.553 | 12.172 | 13.217 | 12.771 |
| EMGALR | 13.861 | 15.209 | 13.656 | 14.597 | 15.353 | 14.589 | 15.743 | 13.274 |
| EMGALS | 9.806 | 10.849 | 9.693 | 10.361 | 10.930 | 10.266 | 11.327 | 9.390 |
| RESAMP | 141.059 | 140.591 | 142.384 | 139.788 | 140.304 | 140.632 | 139.365 | 142.479 |
| RESAMS | 23.027 | 24.191 | 22.421 | 23.040 | 25.367 | 24.756 | 23.071 | 23.001 |
| RESPDM | 2.606 | 2.563 | 2.598 | 2.615 | 2.541 | 2.622 | 2.548 | 2.543 |
| RESPDS | 0.249 | 0.335 | 0.281 | 0.322 | 0.273 | 0.285 | 0.312 | 0.279 |
| ECGRAM | 245.094 | 246.864 | 247.442 | 245.726 | 244.771 | 245.142 | 246.906 | 245.889 |
| ECGRAS | 20.366 | 23.290 | 20.957 | 22.576 | 21.952 | 21.559 | 20.797 | 23.129 |
| ECGRDM | 0.705 | 0.697 | 0.713 | 0.698 | 0.693 | 0.707 | 0.696 | 0.701 |
| ECGRDS | 0.086 | 0.103 | 0.089 | 0.097 | 0.098 | 0.093 | 0.095 | 0.095 |
| ECGP/R | 0.006 | 0.012 | 0.008 | 0.009 | 0.008 | 0.008 | 0.008 | 0.009 |
| ECGQ/R | -0.146 | -0.151 | -0.148 | -0.147 | -0.151 | -0.147 | -0.151 | -0.148 |
| ECGS/R | -0.171 | -0.183 | -0.174 | -0.178 | -0.180 | -0.177 | -0.178 | -0.176 |
| ECGT/R | 0.157 | 0.151 | 0.151 | 0.154 | 0.157 | 0.153 | 0.154 | 0.154 |
| ECGPIN | 0.046 | 0.062 | 0.047 | 0.059 | 0.056 | 0.049 | 0.056 | 0.057 |
| ECGQIN | 0.187 | 0.181 | 0.186 | 0.181 | 0.185 | 0.185 | 0.183 | 0.184 |
| ECGRIN | 0.039 | 0.038 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 | 0.039 |
| ECGSIN | 0.143 | 0.141 | 0.143 | 0.141 | 0.140 | 0.142 | 0.141 | 0.142 |
| ECGTIN | 0.130 | 0.124 | 0.128 | 0.126 | 0.126 | 0.128 | 0.126 | 0.127 |

Table C-4. Means of Main Effects For Flight Performance Measures in Approach Segment

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| PITCH | 0.096 | 0.088 | 0.091 | 0.084 | 0.100 | 0.097 | 0.107 | 0.072 |
| ROLL | 0.161 | 0.184 | 0.137 | 0.161 | 0.218 | 0.150 | 0.191 | 0.176 |
| POWER | 0.335 | 0.326 | 0.285 | 0.318 | 0.388 | 0.342 | 0.336 | 0.313 |
| HEADING | 0.270 | 0.207 | 0.192 | 0.213 | 0.310 | 0.220 | 0.241 | 0.254 |
| ROLLAC | 3.703 | 4.279 | 2.825 | 3.643 | 5.505 | 3.659 | 3.739 | 4.574 |
| PITCHAC | 1.046 | 1.448 | 1.099 | 1.145 | 1.497 | 0.999 | 1.373 | 1.368 |
| YAWACC | 2.724 | 2.663 | 1.432 | 2.480 | 4.167 | 2.635 | 2.661 | 2.784 |
| SPEEDER | 3.602 | 5.940 | 3.913 | 4.198 | 6.202 | 4.877 | 5.884 | 3.552 |
| S/PITCH | 0.817 | 0.815 | 0.815 | 0.816 | 0.816 | 0.817 | 0.815 | 0.815 |
| S/ROLL | 1.131 | 1.127 | 1.133 | 1.130 | 1.125 | 1.128 | 1.129 | 1.131 |
| S/YAW | 0.739 | 0.732 | 0.738 | 0.736 | 0.731 | 0.735 | 0.734 | 0.736 |
| POWSET | 0.274 | 0.288 | 0.271 | 0.277 | 0.296 | 0.283 | 0.283 | 0.277 |
| ALTERR | 21.561 | 21.757 | 18.964 | 20.682 | 25.332 | 23.342 | 21.262 | 20.374 |
| CXERR | 52.143 | 53.091 | 53.032 | 43.575 | 61.246 | 47.040 | 50.662 | 60.149 |

Table C-5. Means of Main Effects for Flight Performance Measures in Decelerated Segment

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| PITCH | 0.135 | 0.129 | 0.120 | 0.131 | 0.144 | 0.128 | 0.164 | 0.103 |
| ROLL | 0.167 | 0.169 | 0.135 | 0.164 | 0.205 | 0.146 | 0.176 | 0.182 |
| POWER | 0.153 | 0.160 | 0.126 | 0.141 | 0.202 | 0.137 | 0.201 | 0.131 |
| HEADING | 0.278 | 0.263 | 0.254 | 0.255 | 0.302 | 0.179 | 0.223 | 0.409 |
| ROLLAC | 3.607 | 4.269 | 3.417 | 3.647 | 4.750 | 3.450 | 3.806 | 4.558 |
| PITCHAC | 1.500 | 1.994 | 1.571 | 1.661 | 2.008 | 1.404 | 1.867 | 1.969 |
| YAWACC | 3.662 | 2.815 | 2.732 | 3.107 | 3.876 | 2.770 | 3.183 | 3.762 |
| SPEEDER | 4.986 | 5.516 | 4.690 | 4.572 | 6.491 | 4.941 | 6.837 | 3.976 |
| S/PITCH | 0.674 | 0.679 | 0.679 | 0.673 | 0.678 | 0.674 | 0.680 | 0.675 |
| S/ROLL | 1.000 | 1.001 | 1.030 | 0.999 | 0.973 | 0.999 | 1.002 | 1.002 |
| S/YAW | 0.586 | 0.583 | 0.562 | 0.585 | 0.606 | 0.587 | 0.589 | 0.577 |
| POWSET | 0.505 | 0.512 | 0.508 | 0.508 | 0.510 | 0.505 | 0.509 | 0.512 |
| ALTERR | 8.369 | 9.424 | 6.846 | 7.588 | 12.257 | 7.665 | 12.168 | 6.858 |
| CXTERR | 55.756 | 105.685 | 31.626 | 51.935 | 158.603 | 50.739 | 71.287 | 120.136 |

Table C-6. Means of Main Effects for Flight Performance Variables in Hover Segment

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| PITCH | 0.114 | 0.117 | 0.100 | 0.110 | 0.135 | 0.119 | 0.134 | 0.092 |
| ROLL | 0.150 | 0.173 | 0.118 | 0.163 | 0.204 | 0.146 | 0.168 | 0.171 |
| POWER | 0.253 | 0.255 | 0.194 | 0.234 | 0.335 | 0.243 | 0.286 | 0.235 |
| HEADING | 0.334 | 0.298 | 0.215 | 0.280 | 0.453 | 0.276 | 0.306 | 0.366 |
| ROLLAC | 3.979 | 4.688 | 3.395 | 4.043 | 5.562 | 3.916 | 4.111 | 4.972 |
| PITCHAC | 1.486 | 2.103 | 1.536 | 1.744 | 2.105 | 1.494 | 1.931 | 1.960 |
| YAWACC | 3.969 | 3.187 | 2.669 | 3.419 | 4.647 | 3.447 | 3.556 | 3.732 |
| SPEEDER | 3.656 | 4.556 | 3.417 | 3.650 | 5.251 | 4.046 | 4.925 | 3.348 |
| S/PITCH | 0.748 | 0.750 | 0.746 | 0.746 | 0.754 | 0.749 | 0.749 | 0.749 |
| S/ROLL | 1.131 | 1.126 | 1.137 | 1.129 | 1.120 | 1.128 | 1.130 | 1.128 |
| S/YAW | 0.729 | 0.720 | 0.723 | 0.727 | 0.724 | 0.726 | 0.726 | 0.723 |
| POWSET | 0.333 | 0.343 | 0.336 | 0.337 | 0.341 | 0.338 | 0.332 | 0.344 |
| ALTERR | 17.874 | 19.850 | 13.185 | 16.219 | 27.184 | 18.401 | 21.076 | 17.112 |
| CXERR | 37.749 | 58.223 | 28.275 | 43.206 | 72.478 | 30.705 | 40.102 | 73.152 |

Table C-7. Means of Main Effects for Oculometer Measures Across Segments Approach Segment

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| SACCLM | 1.498 | 1.595 | 1.535 | 1.516 | 1.589 | 1.597 | 1.361 | 1.683 |
| SACCLS | 1.500 | 1.608 | 1.562 | 1.553 | 1.548 | 1.558 | 1.559 | 1.546 |
| DWELLM | 0.709 | 0.370 | 0.559 | 0.519 | 0.541 | 0.444 | 0.763 | 0.411 |
| DWELLS | 0.686 | 0.319 | 0.520 | 0.462 | 0.526 | 0.392 | 0.734 | 0.381 |
| FIXRATE | 1.909 | 3.080 | 2.394 | 2.488 | 2.602 | 2.675 | 2.081 | 2.728 |
| BLINKR | 0.124 | 0.409 | 0.268 | 0.236 | 0.295 | 0.275 | 0.293 | 0.231 |
| PUPILD | 5.717 | 5.421 | 5.504 | 5.529 | 5.673 | 5.547 | 5.671 | 5.488 |

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| SACCLM | 1.531 | 1.663 | 1.557 | 1.572 | 1.662 | 1.649 | 1.366 | 1.776 |
| SACCLS | 1.468 | 1.637 | 1.526 | 1.543 | 1.589 | 1.578 | 1.479 | 1.601 |
| DWELLM | 0.732 | 0.368 | 0.589 | 0.529 | 0.532 | 0.434 | 0.789 | 0.427 |
| DWELLS | 0.717 | 0.310 | 0.569 | 0.488 | 0.483 | 0.392 | 0.750 | 0.399 |
| FIXRATE | 1.843 | 3.089 | 2.298 | 2.487 | 2.614 | 2.638 | 2.088 | 2.673 |
| BLINKR | 0.143 | 0.490 | 0.243 | 0.302 | 0.403 | 0.315 | 0.359 | 0.274 |
| PUPILD | 5.671 | 5.324 | 5.500 | 5.444 | 5.548 | 5.481 | 5.623 | 5.389 |

| MEASURE | MOTION | | WIND | | | DISPLAY | | |
|---|---|---|---|---|---|---|---|---|
| | NO | YES | 0/0 | 8/4 | 16/8 | GRAPH I | GRAPH II | F-DIR |
| SACCLM | 1.285 | 1.395 | 1.341 | 1.338 | 1.340 | 1.384 | 1.146 | 1.490 |
| SACCLS | 1.146 | 1.341 | 1.258 | 1.278 | 1.195 | 1.279 | 1.193 | 1.259 |
| DWELLM | 0.831 | 0.439 | 0.653 | 0.639 | 0.613 | 0.519 | 0.896 | 0.489 |
| DWELLS | 0.791 | 0.398 | 0.609 | 0.604 | 0.570 | 0.475 | 0.844 | 0.465 |
| FIXRATE | 1.634 | 2.783 | 2.132 | 2.162 | 2.332 | 2.360 | 1.806 | 2.460 |
| BLINKR | 0.112 | 0.357 | 0.230 | 0.242 | 0.232 | 0.211 | 0.301 | 0.191 |
| PUPILD | 5.855 | 5.482 | 5.595 | 5.642 | 5.769 | 5.632 | 5.759 | 5.615 |

# APPENDIX D

## OPINION DATA SCORES

Table D-1. Workload Opinion Raw Scores Across Six Experimental Subjects

| Display | Motion Base | S1 | S2 | S3 | S4 | S5 | S6 |
|---|---|---|---|---|---|---|---|
| GRAPHIC | MOVING | 3.0 | 1.8 | 4.0 | 4.0 | 4.0 | 7.0 |
| BAN | MOVING | 5.0 | 2.0 | 6.5 | 5.0 | 5.5 | 8.0 |
| F-DIR | MOVING | 4.0 | 5.8 | 4.0 | 4.0 | 5.5 | 9.0 |
| GRAPHIC | FIXED | 3.0 | 1.8 | 4.0 | 4.0 | 5.0 | 7.5 |
| BAN | FIXED | 5.0 | 2.0 | 6.5 | 5.0 | 7.5 | 8.5 |
| F-DIR | FIXED | 3.0 | 5.3 | 5.5 | 6.0 | 7.5 | 9.0 |

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Langley Technical Monitor: Gene C. Moen

Final Report

16. Abstract

A methodological approach to measuring workload was investigated for evaluation of new concepts in VTOL aircraft displays. Physiological, visual response, and conventional flight performance measures were recorded for landing approaches performed in the NASA Visual Motion Simulator (VMS). Three displays (two computer graphic and a conventional flight director), three crosswind amplitudes, and two motion base conditions (fixed vs. moving base) were tested in a factorial design.

Multivariate discriminant functions were formed from flight performance and/or visual response variables. The flight performance variable discriminant showed maximum differentiation between crosswind conditions. The visual response measure discriminant maximized differences between fixed vs. motion base conditions and experimental displays.

Physiological variables were used to attempt to predict the discriminant function values for each subject/condition trial. The weights of the physiological variables in these equations showed agreement with previous studies. High muscle tension, light but irregular breathing patterns, and higher heart rate with low amplitude all produced higher scores on this scale and thus represent higher workload levels.

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